Geotechnical Evaluation Report

US Highway 85 Intersection Improvements
From Near US 2 and US 85 Junction north to Williams County Road 4
Williams County, North Dakota
SOIA-7-085(092)183, PCN 20208

Prepared for

SRF Consulting Group, Inc.

Professional Certification:
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of North Dakota.

REGISTERED PROFESSIONAL ENGINEER
EZRA
BALLINGER
PE 7328
DATE 4-30-13
NORTH DAKOTA

Ezra Ballinger, PE
Associate Principal/Project Engineer
Registration Number: PE-7328
April 30, 2013

Project FA-12-00359

Braun Intertec Corporation

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April 30, 2013 Project FA-12-00359

Mr. Eric Bach
SRF Consulting Group, Inc.
Case Plaza, Suite 226
One North 2nd Street
Fargo, ND 58102

Re: Geotechnical Evaluation Report (Interim Report)
US Highway 85 Intersection Improvements
From Near US 2 and US 85 Junction north to Williams County Road 4
SOIA-7-085(092)183, PCN 20208
Williams County, North Dakota

Dear Mr. Bach:

We are pleased to present this DRAFT Geotechnical Evaluation Report for the proposed construction of a US Highway 85 bypass around the northwest side of Williston, North Dakota in Williams County. Per your request, we are submitting an interim report addressing the southern 2 ½ miles of the project from the start of the project about ½ mile south of the intersection between US Highway 85 and US Highway 2 north to the intersection between 52nd Street NW and 141st Avenue NW. A report for the entirety of the project (including the portion discussed herein) will be prepared once drilling has been completed this spring. This project was completed in accordance with our proposal dated February 25, 2013.

In the Appendix of this report we present the Linear Soils Report which summarizes the results of laboratory testing in borings along the proposed route. The Appendix also contains the Boring Logs, Grain Size Accumulation Curves and Proctors. This information is being provided to SRF Consulting Group, Inc. (SRF) and the North Dakota Department of Transportation's (NDDOT) Construction Division, Materials and Research Division, and the Williston District to assist in the roadway design and determination of quantities.

Thank you for making Braun Intertec your geotechnical consultant for this project. If you have questions about this report, or if there are other services that we can provide in support of our work to date, please contact Ezra Ballinger by phone at 701.232.8701 or by email at eballinger@braunintertec.com.

Sincerely,

BRAUN INTERTEC CORPORATION

Ezra Ballinger, PE
Associate Principal/Project Engineer

Steven P. Nagle, PE
Principal Engineer/Vice President

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Appendix

A. Introduction

A.1. Project Description

The North Dakota Department of Transportation (NDDOT) is planning the construction of a bypass route for US Highway 85 in Williams County around the northwest side of Williston, North Dakota. The selected route will use a combination of existing county or township roads and undeveloped land. The route will proceed northward for about ½ mile from the junction between US Highway 85 and US Highway 2, then northwest to 141st Avenue Northwest (NW), north for about 1 mile along 141st, then northwest to 142nd Avenue NW, north along 142nd for about 3 miles, then east along 56th Street NW for 1 mile, then northeast to 57th Street NW, then east along 57th for 4 miles to its junction with US Highway 2 and US Highway 85 north of Williston. This project has been given NDDOT project number SOIA-7-085(092)183, PCN 20208.

The proposed roadway will typically be a four-lane median divided highway. Based on the preliminary plan and profile for the route, the majority of the project will involve cuts or fills of less than 5 feet, with isolated locations, especially in the northern half of the project where grade changes of 10 to 20 feet are planned.

Two new interchanges will also be constructed – one at the north end and one at the south end. In addition a new box culvert will be constructed where 142nd Avenue NW crosses Sand Creek just south of 56th Street NW.

The scope of our geotechnical evaluation is to provide SRF and the NDDOT with a linear soils survey for the route, an evaluation of the settlement potential under deep fills, recommendations for the new box culvert at Sand Creek and an evaluation of potential borrow sources. It is our understanding that the pavement section will be determined by the NDDOT and that the NDDOT will also be performing the drilling and geotechnical design of the interchanges at the north and south ends of the project.

A.2. Purpose

The purpose of this geotechnical evaluation is to assist SRF and the NDDOT with the design of the project.

A.3. Scope of Services

We submitted a proposal to Mr. Eric Bach of SRF on February 25, 2013. Our scope of services in the proposal consisted of the following tasks and subtasks:

- Engineering and Project Management
  - Develop project scope,
  - Site reconnaissance,
  - Prepare drilling instructions/call in utility locates,
  - Drilling oversight;
  - Traffic control,
  - Oversee laboratory testing,
  - Prepare boring logs,
  - Roadway design with regard to the anticipated fills,
  - Attend design meetings/conference calls,
  - Prepare a draft geotechnical report,
  - Prepare final geotechnical report, and
  - Overall project management of drilling, laboratory testing, and engineering.

- Drilling
  - Drill 2 standard penetration test borings to an average depth of 40 feet for the box culvert crossing at Sand Creek,
  - Drill 140 power auger borings to an average depth of 15 feet at approximately 500 feet spacings along the proposed route,
  - Drill 24 power auger borings to an average depth of 25 feet for borrow areas, and
  - Stake boring locations and coordinate with utility companies to locate buried utilities.

- Laboratory Testing
  - Conduct an average of 12 moisture contents, one modified Proctor, one Atterberg limit, and one grain size analysis test for the structure borings,
  - Conduct an average of 13 moisture contents, one modified Proctor, one Atterberg limit, and one grain size analysis test for each of the roadway borings, and
  - Conduct and average of 13 moisture contents, 1 ½ modified Proctors, 1 ½ Atterberg limits, and 1 ½ grain size analysis tests for each of the borrow borings.

Our scope of work is still ongoing and may be modified as the project progresses.

B. Results

B.1. Borings

Log of Boring sheets for our test borings are included in the Appendix. The logs identify and describe the geologic materials that were penetrated, and present the results of penetration resistance tests (if any) performed within them, laboratory tests performed on samples retrieved from them, and groundwater measurements. The roadway borings for this project have been numbered sequentially beginning with LSS-01 at the south end of the project and proceeding northward. This interim report addresses borings LSS-01 through LSS-30.

Boring LSS-07 was originally staked and planned to be performed near the center of the existing intersection between US Highway 85 and US Highway 2, however, due to the need for extensive traffic control and safety concerns, as well as buried utilities, that boring was not performed and a suitable offset location was not identified. Boring LSS-09 was originally planned to be advanced about 1000 feet north of the existing US Highway 2 and US Highway 85 intersection on property currently controlled by Cal Frac. However, when we visited the site on separate occasions our drillers were not able to find anyone who would grant access to the property. The majority of our borings were performed within about 12 feet of the proposed roadway centerline except where utilities or access prevented access. The coordinates of the drilled locations are provided on the attached boring logs.

Strata boundaries were inferred from changes in the auger cuttings. In the deeper borings sampling was not performed continuously and the strata boundary depths are only approximate. The boundary depths likely vary away from the boring locations, and the boundaries themselves may also occur as gradual rather than abrupt transitions.

B.2. Geology

A review of geologic information in the vicinity of the site indicates that the soils are glacial till along the majority of the project, and all of the southern 2 ½ miles. Specifically, “Plate 1. Geologic Map of Williams County, North Dakota” (North Dakota Geologic Survey and North Dakota State Water Commission, Bulletin 48, County Groundwater Studies 9, Plate 1, undated) indicates the soils consist primarily of sheet moraine composed of till (an unsorted mixture of gravel, sand, silt, clay and occasional boulders.

For the project, the predominant soil type encountered was A-6 soil.

B.3. Site Reconnaissance

We have visited the site on numerous occasions during 2012 in conjunction with our Phase I Environmental Site Assessment for the project. We also drove as much of it as we could in order to note the site terrain and evaluate potential drilling issues on the project. The topography along the alignment was typically gently undulating, with some areas near the northern portion of the project where the hills were steeper. For the southern 2 ½ miles that are specifically addressed by this report, the first ½ mile of the project is along the existing Highway 85 alignment south of the intersection with US Highway 2. The next ½ mile proceeds north through Cal-Frac and other industrial property. The proposed route then proceeds northwest for about ¾ mile to the existing County Road 4 alignment where it turns northward along that alignment.

The ditches along US Highway 85 south of Highway 2 were about 2 to 5 feet deep and were covered in snow at the time of our drilling. For the portion of the project that proceeds north and then northwest through the industrial property over to County Road 4, we noted that the roadway alignment appeared to have been rough graded last fall. A few inches of snow was typically present on the ground in the area. A typical view of this portion of the project at the time of our drilling is shown in Figure 1 below. As noted above, we were not able to access the Cal-Frac property immediately north of US Highway 2 because it was gated and blocked off and we were unable to find personnel that would allow us to access the property. Where the proposed alignment follows the existing County Road 4 alignment, we noted that the ditches contained ice, snow, cattails, and were several feet below the roadway centerline in many areas. The ditches, in-slopes and back-slopes were vegetated with native grasses and shrubs.

Figure 1. Site Conditions near Station 9710+00 during drilling

B.4. Soil Classification and Comments

For the portion of the project addressed by this interim report, we collected a total of 28 bulk samples and 290 moisture content samples from the flight auger. The borings for the linear soils survey were extended to depths of 5 to 20 feet depending on the amount of cut or fill anticipated at the location.

The results of our laboratory testing for the linear soils survey are shown in Tables 1 and 2 below and on the boring logs and laboratory results sheets, and Linear Soils Report which are provided in the Appendix.

Table 1. Summary of Classification, Moisture Content, and Maximum Dry Unit Weight Testing for Roadway Borings

AASHTO Classifications	Quantity	In Place Moisture Range (%)		In Place Moisture Average (%)	AASHTO T-180 Optimum Moisture Average (%)	AASHTO T-180 Maximum Dry Unit Weight Average (pcf)
		Min	Max			
A-1-b	1	5	9	7	5	138
A-2-4	2	13	18	16.1	6	135.5
A-2-6	2	12	19	14.8	6.5	134.5
A-6	19	4	26	11.9	9.2	130.2
A-7-6	4	9	19	14.4	11.0	124.5

Table 2. Summary of Atterberg Limits Testing

AASHTO Classifications	Quantity	Liquid Limit Range (%)		Liquid Limit Average (%)	Plastic Limit Range (%)		Plastic Limit Average (%)	Plastic Index Range		Plastic Index Average
		Min	Max		Min	Max		Min	Max	
A-1-b	1	NP[1]	NP[1]	NP[1]	NP[1]	NP[1]	NP[1]	NP[1]	NP[1]	NP[1]
A-2-4	2	22	23	23	14	14	14	8	9	9
A-2-6	2	24	28	26	13	13	13	11	15	13
A-6	19	25	40	34	10	16	13	13	27	20
A-7-6	4	41	44	43	13	14	14	27	31	29

1. NP indicates the sample tested was Non-Plastic.

As can be seen in Table 1, the majority of the soils encountered in the linear soils survey borings were generally 2 to 10 percent wet of their optimum moisture contents as determined by AASHTO T-180. The predominant soils (A-6) were, on the average, about 2 ½ percent over their optimum moisture content. Depending on the time of construction, we anticipate the in place moisture contents are likely to be higher during spring thaw and after heavy rain events.

The soils encountered in those borings are considered moderately to highly frost-susceptible. The soils classified as A-6 and A-7-6 soils are generally considered fair to poor subgrade materials. A group index of 20 or greater indicates very poor subgrade materials. Of the 23 soils that were classified as A-6 or A-7-6 materials, all of them had a group index less than 20 (ranged from 3 to 20) and the average group index was 10.

B.5. Groundwater

Groundwater was not observed in any of the linear soils survey borings performed to date. The observation periods were relatively short for all of the borings and water can be anticipated in other locations at the time of construction. In addition, seasonal and annual fluctuations in groundwater levels should be anticipated. Elevated water levels should be anticipated following spring thaw and periods of heavy precipitation.

C. Analyses and Recommendations

C.1. Proposed Construction

We have been provided with and reviewed preliminary plan and profile drawings for this project prepared by SRF in March 2013. For the portion of the project south of US Highway 2, the existing Highway 85 roadway may be widened and the intersection between Highway 2 and Highway 85 will be modified. Proceeding north from the existing US Highway 2 intersection, the new alignment will be an undivided or median divided highway having 2 to 4 lanes in either direction through the heavy industrial and developed area within about ½ mile north of US Highway 2.

From approximate Station 9735+00 (about ½ mile north of US Highway 2) to the north, the proposed roadway will be a 4 lane, median divided roadway that will also include a frontage road on either side. Several intersections will be created where the roadway will widen to accommodate one or more turning lanes in each direction. Near Station 9770+00 and continuing north to the end of the segment covered by this interim report, the proposed alignment coincides roughly with the existing alignment of County Road 4.

Based on the profile of the roadway we've reviewed, the vertical alignment of the proposed route will generally involve cuts or fills of less than 5 feet except for a couple of isolated areas near Stations 9765+00 to 9785+00, Station 9800+00 and Station 9810+00 where fills of up to about 8 feet at centerline are planned.

The pavement section for the new roadway will be developed by the NDDOT. We understand that all work on the site will be performed in accordance with NDDOT Standard Specifications.

C.2. Treatment of Organic Soils

Organic soils are present in the ditches for the portions of the alignment along existing roads and also in the entire roadway area where the route will involve entirely new construction. We recommend that all vegetation, root zones and organic topsoils be removed prior to subgrade preparation and placement of new fill in these areas. After the removal of organics, the subgrade should be prepared as indicated in Section C.3. Organic soils that are removed should not be reused as embankment fill; however they could be stockpiled and may be used as dressing on the new embankment slopes.

C.3. Subgrade Preparation

After vegetation and topsoils have been removed, we recommend 12 inches of subgrade preparation in cut areas, and in fill areas where less than 18 inches of fill will be placed. In fill areas where greater than 18 inches of fill will be placed, it is not necessary to perform subgrade preparation beyond topsoil stripping. Subgrade preparation should comply with NDDOT Specification 230.02 B.2 (Type A).

Compaction control for subgrade preparation should be in accordance with AASHTO T-180 and Specification 203.02G Type A.

If unsuitable soils are present below the topsoil, scarification and drying or overexcavation and replacement of the unsuitable soils could be considered.

C.4. Subcutting

Based on the conditions encountered in our borings, we do not anticipate that subcutting will be necessary along the majority of the project. Where localized soft spots or unsuitable soils are encountered during subgrade preparation we recommend that subcutting of the soils be performed as necessary and in accordance with NDDOT Specification 203.02 C.

C.5. Subgrade Drainage

Due to predominantly clay soils with more than 20 percent of their particles passing a #200 sieve, we recommend that drainage be provided for aggregate base placed over the on-site soils. Drainage should be provided by sloping the subgrade and daylighting the aggregate base to the shoulders. Water should not be allowed to infiltrate the clay subgrade but instead flow down the in-slopes and be collected and routed through the ditches and culverts on either side of the road.

C.6. Unsuitable Materials

Based on the soils encountered in our borings, we anticipate that the soils encountered in excavations for the project will be suitable for construction of the roadway embankment. As discussed in Section C.2, organic soil deposits should not be used as embankment fill. We recommend that imported soils used as borrow be similar to the existing subgrade soils. Any soils encountered or imported that cannot be moisture conditioned and compacted according to the recommendations of this report should not be used.

C.7. Settlement

Settlement will occur due to compression of the soils underlying the new roadway embankments (the foundation soils), as well as settlement of the embankment fill itself.

C.7.a. Foundation Soils

Along the majority of the alignment we anticipate foundation soil settlements of less than 1 inch will be realized. The settlements will be greatest where the new fill is the thickest under the roadway and lessen where the amount of fill typically decreases along the in-slope away from the roadway. Where fills of 5 to 8 feet are planned near Stations 9765+00 to 9785+00, Station 9800+00 and Station 9810+00, we anticipate that settlement of about 1 ½ to 2 inches may be realized under the center of the roadway. The majority of the foundation soil settlement along the alignment is likely to occur within a few weeks to two months after construction of the new embankment.

C.7.b. Settlement of Embankment Fill

When fill is placed, it will compress under its own weight, resulting in settlement. In clean sand soils, this settlement occurs rapidly (typically during construction), however, with clayey soils, this settlement occurs over many years. We anticipate that the majority of the soils used as embankment fill for this project will be clayey. We estimate that the total settlement of embankment fill (whether sand or clay) will be less than 1 inches for new embankments up to 8 feet thick.

C.8. Backslopes

Based on experience with similar projects, we have assumed that where necessary the design cross sections will include cutting the existing soil back to a 4H:1V (Horizontal:Vertical) slope outside of the ditches. We understand that the NDDOT would prefer to use 4:1 backslopes wherever possible. If cases exist where it is not possible to use a 4:1, a 3:1 back-slope may be adequate from a stability standpoint, however, site specific evaluations should be performed for any areas under considerations for steepening beyond a 4:1.

We recommend that for any slopes greater than 20 feet tall, benches about 10 feet wide be constructed no more than 20 vertical feet apart to reduce the potential for erosion due to water flowing down the slope face. We also recommend that the back-slopes be planted with native grasses/shrubs, where possible, as a further protection against erosion. We anticipate that excavation can be performed with typical excavation equipment.

D. Construction

D.1. Excavation

Bedrock that impeded our drilling equipment was not encountered in our borings; therefore it is our opinion that the soils in the borings can be excavated with standard equipment such as scrapers, earth movers and backhoes. Depending on the time of construction, the subgrades may be excessively wet. It may be necessary to limit the activities of rubber-tired equipment directly on the embankment until the soils are dried.

D.2. Testing

We recommend density testing of backfill and fill placed for the roadway. As indicated above, we recommend the use of AASHTO T180. The testing frequency should follow NDDOT requirements.

E. Procedures

E.1. Borings

The linear soils survey borings were drilled with a truck-mounted core and auger drill equipped with power auger. The borings were performed by advancing the auger at 1- or 2-foot intervals and "dead-pulling" the auger to collect moisture content samples off of the auger at 1-foot spacings. A bulk sample of the soil encountered near the anticipated bottom of the aggregate base was collected from the auger after moisture content samples were collected. Sample intervals and corresponding depths are shown on the boring logs.

E.2. Material Classification and Testing

E.2.a. Visual and Manual Classification

The geologic materials encountered were visually and manually classified in accordance with ASTM Standard Practice D 2488. A chart explaining the classification system is attached. Samples were placed in jars or bags and returned to our facility for review and storage.

E.2.b. Laboratory Testing

The results of the laboratory tests performed on geologic material samples are noted on or follow the appropriate attached exploration logs. The tests were performed in accordance with AASHTO procedures.

E.3. Groundwater Measurements

The drillers checked for groundwater as the borings were advanced, and again after auger withdrawal. The boreholes were then backfilled.

F. Qualifications

F.1. Variations in Subsurface Conditions

F.1.a. Material Strata

Our evaluation, analyses and recommendations were developed from a limited amount of site and subsurface information. It is not standard engineering practice to retrieve material samples from exploration locations continuously with depth, and therefore strata boundaries and thicknesses must be inferred to some extent. Strata boundaries may also be gradual transitions, and can be expected to vary in depth, elevation and thickness away from the exploration locations.

Variations in subsurface conditions present between exploration locations may not be revealed until additional exploration work is completed, or construction commences. If any such variations are revealed, our recommendations should be re-evaluated. Such variations could increase construction costs, and a contingency should be provided to accommodate them.

F.1.b. Groundwater Levels

Groundwater measurements were made under the conditions reported herein, shown on the exploration logs, and interpreted in the text of this report. It should be noted that the observation periods were relatively short, and groundwater can be expected to fluctuate in response to rainfall, flooding, irrigation, seasonal freezing and thawing, surface drainage modifications and other seasonal and annual factors.

F.2. Continuity of Professional Responsibility

F.2.a. Plan Review

This report is based on a limited amount of information, and a number of assumptions were necessary to help us develop our recommendations. It is recommended that our firm review the geotechnical aspects of the designs and specifications, and evaluate whether the design is as expected, if any design changes have affected the validity of our recommendations, and if our recommendations have been correctly interpreted and implemented in the designs and specifications.

F.2.b. Construction Observations and Testing

It is recommended that we be retained to perform observations and tests during construction. This will allow correlation of the subsurface conditions encountered during construction with those encountered by the borings, and provide continuity of professional responsibility.

F.3. Use of Report

This report is for the exclusive use of the parties to which it has been addressed. Without written approval, we assume no responsibility to other parties regarding this report. Our evaluation, analyses and recommendations may not be appropriate for other parties or projects.

F.4. Standard of Care

In performing its services, Braun Intertec Corporation used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

Appendix

DENOTES APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING

250' 0 500'

SCALE: 1" = 500'

SOIL BORING LOCATION SKETCH
GEOTECHNICAL EVALUATION
WILLISTON NW BYPASS
SEVERAL ROUTES NW OF WILLISTON
WILLIAMS COUNTY, NORTH DAKOTA

BRAUN INTERTEC
11001 Hampshire Avenue So.
Minneapolis, MN 55438
PH. (952) 995-2000
FAX (952) 995-2020

Base Dwg Provided By:
SRF

Project No:	FA1200359
Drawing No:	FA1200359
Scale:	1" = 500'
Drawn By:	BJB
Date Drawn:	4/10/13
Checked By:	EB
Last Modified:	4/10/13
Sheet:	1 of 2
Fig:	

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DENOTES APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING

250' 0 500'

SCALE: 1" = 500'

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SOIL BORING LOCATION SKETCH

GEOTECHNICAL EVALUATION
WILLISTON NW BYPASS
SEVERAL ROUTES NW OF WILLISTON
WILLIAMS COUNTY, NORTH DAKOTA

BRAUN INTERTEC
11001 Hampshire Avenue So.
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Project No:	FA1200359
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Date Drawn:	4/10/13
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Last Modified:	4/10/13
Sheet:	2 of 2
Fig:	

Linear Report of Tests on Soil Samples

PROJECT NO.: FA-12-00359
PROJECT: Williston NW Bypass
Highway 85
Williams County, North Dakota

Braun Intertec Corporation
PO Box 485, West Fargo, ND
Phone: (701) 232-8701

BRAUN INTERTEC

Boring Number	LSS-001	LSS-002	LSS-003	LSS-004	LSS-005
Northing	429505.60	429905.18	430404.71	430904.24	431403.73
Easting	1181607.08	1181623.21	1181643.38	1181663.52	1181683.69
Elevation	0.0	0.0	0.0	0.0	0.0
Sample Depth	2.1' - 5'	2' - 5'	2' - 5'	2' - 5'	2.5' - 5'
% Passing 3/8" Sieve	100	91	89	94	86
% Passing No. 4 Sieve	94	70	69	81	70
% Passing No. 10 Sieve	87	53	53	68	57
% Coarse Sand (-No. 10, +No. 40)	12	9	13	12	11
% Fine Sand (-No. 40, +No. 200)	27	23	23	23	29
% Silt (0.075 - 0.002 mm)	40	17	13	30	13
% Clay (<0.002 mm)	7	5	5	5	5
% Finer than 0.02 mm	16	10	10	11	11
Frost Group	F3	F2	F2	F2	F2
Liquid Limit (-No. 40)	28	24	23	28	NP
Plastic Limit (-No. 40)	13	13	14	13	NP
Plasticity Index (-No. 40)	15	11	9	15	NP
Soil Color	Brown	Brown	Brown	Brown	Brown
USCS Classification	SC	SC	SC	SC	SM
Soil Classification (AASHTO M-15)	A-6 (3)	A-2-6 (0)	A-2-4 (0)	A-2-6 (1)	A-1-b (0)
Optimum Moisture (%)	7.0	6.0	6.0	7.0	5.0
Maximum Dry Density (pcf)	135.0	136.0	134.0	133.0	138.0

Depth (ft) (top 8 samples)	Moisture (%) (top 8 samples)									
2.0	12	2.0	13	2.0	16	2.0	15	2.0	7
3.0	14	3.0	17	3.0	16	3.0	13	3.0	5
4.0	10	4.0	19	4.0	16	4.0	12	4.0	9
Avg. Moisture of Sample Depth (all)	12	16		16		13		7	

Linear Report of Tests on Soil Samples

PROJECT NO.: FA-12-00359
PROJECT: Williston NW Bypass
Highway 85
Williams County, North Dakota

Braun Intertec Corporation
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Phone: (701) 232-8701

Boring Number	LSS-006	LSS-008	LSS-010	LSS-011	LSS-012
Northing	431903.26	432643.84	433640.42	434139.75	434639.32
Easting	1181703.85	1181734.24	1181852.83	1181806.27	1181878.00
Elevation	0.0	2087.7	2093.9	2093.9	2092.0
Sample Depth	2.2' - 5'	1' - 10'	3' - 10'	0' - 6'	0' - 10'
% Passing 3/8" Sieve	77	100	100	100	100
% Passing No. 4 Sieve	62	98	96	97	95
% Passing No. 10 Sieve	50	95	93	94	88
% Coarse Sand (-No. 10, +No. 40)	12	12	12	8	10
% Fine Sand (-No. 40, +No. 200)	24	26	26	22	21
% Silt (0.075 - 0.002 mm)	11	36	36	43	38
% Clay (<0.002 mm)	4	21	19	22	19
% Finer than 0.02 mm	9	39	38	39	36
Frost Group	F2	F3	F3	F3	F3
Liquid Limit (-No. 40)	22	31	29	34	31
Plastic Limit (-No. 40)	14	13	14	15	14
Plasticity Index (-No. 40)	8	18	15	19	17
Soil Color	Brown	Brown	Brown	Brown	Brown
USCS Classification	SC	CL	CL	CL	CL
Soil Classification (AASHTO M-15)	A-2-4 (0)	A-6 (7)	A-6 (5)	A-6 (10)	A-6 (6)
Optimum Moisture (%)	6.0	7.0	9.0	9.0	9.0
Maximum Dry Density (pcf)	137.0	135.0	131.0	131.0	131.0

Depth (ft) (top 8 samples)	Moisture (%) (top 8 samples)									
2.0	13	1.0	12	3.0	20	0.0	8	0.0	14
3.0	18	2.0	9	4.0	11	1.0	8	1.0	12
4.0	18	3.0	9	5.0	9	2.0	13	2.0	13
		4.0	8	6.0	9	3.0	15	3.0	14
		5.0	13	7.0	16	4.0	17	4.0	12
		6.0	15	8.0	14	5.0	11	5.0	13
		7.0	15	9.0	14			6.0	14
		8.0	15					7.0	15
Avg. Moisture of Sample Depth (all)		16		12		13		12		14

Linear Report of Tests on Soil Samples

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PO Box 485, West Fargo, ND
Phone: (701) 232-8701

Boring Number	LSS-013	LSS-014	LSS-015	LSS-016	LSS-017
Northing	435128.98	435577.16	435959.20	436324.66	436690.07
Easting	1181754.64	1181536.53	1181215.26	1180874.06	1180532.97
Elevation	2091.2	2088.7	2083.9	2079.1	2074.0
Sample Depth	1' - 10'	1' - 10'	2' - 10'	3' - 10'	1' - 6'
% Passing 3/8" Sieve	99	98	97	95	100
% Passing No. 4 Sieve	97	96	96	93	97
% Passing No. 10 Sieve	94	93	93	89	95
% Coarse Sand (-No. 10, +No. 40)	7	8	8	7	8
% Fine Sand (-No. 40, +No. 200)	21	22	22	22	21
% Silt (0.075 - 0.002 mm)	37	38	39	35	39
% Clay (<0.002 mm)	30	25	25	26	27
% Finer than 0.02 mm	48	45	45	43	45
Frost Group	F3	F3	F3	F3	F3
Liquid Limit (-No. 40)	42	37	32	39	40
Plastic Limit (-No. 40)	14	13	12	14	15
Plasticity Index (-No. 40)	28	24	20	25	25
Soil Color	Brown	Brown	Brown	Brown	Brown
USCS Classification	CL	CL	CL	CL	CL
Soil Classification (AASHTO M-15)	A-7-6 (16)	A-6 (12)	A-6 (9)	A-6 (12)	A-6 (14)
Optimum Moisture (%)	10.0	9.0	9.0	9.0	11.0
Maximum Dry Density (pcf)	126.0	129.0	133.0	131.0	125.0

Depth (ft) (top 8 samples)	Moisture (%) (top 8 samples)	LSS-013		LSS-014		LSS-015		LSS-016		LSS-017	
		1.0	12	1.0	12	2.0	8	3.0	16	1.0	12
		2.0	12	2.0	11	3.0	9	4.0	15	2.0	12
		3.0	10	3.0	16	4.0	12	5.0	11	3.0	15
		4.0	11	4.0	16	5.0	14	6.0	12	4.0	15
		5.0	14	5.0	7	6.0	14	7.0	14	5.0	15
		6.0	14	6.0	15	7.0	14	8.0	14		
		7.0	14	7.0	15	8.0	14	9.0	14		
		8.0	12	8.0	16	9.0	15				
Avg. Moisture of Sample Depth (all)		13		14		13		14		14	

Linear Report of Tests on Soil Samples

PROJECT NO.: FA-12-00359
PROJECT: Williston NW Bypass
Highway 85
Williams County, North Dakota

Braun Intertec Corporation
PO Box 485, West Fargo, ND
Phone: (701) 232-8701

Boring Number	LSS-018	LSS-019	LSS-020	LSS-021	LSS-022
Northing	437055.53	437434.57	437881.39	438372.07	438871.65
Easting	1180191.80	1179866.72	1179646.29	1179559.86	1179575.02
Elevation	2074.0	2074.2	2077.0	2088.2	2094.5
Sample Depth	1' - 10'	1' - 10'	1' - 6'	0.5' - 6'	3' - 15'
% Passing 3/8" Sieve	96	90	99	100	99
% Passing No. 4 Sieve	94	87	99	97	97
% Passing No. 10 Sieve	90	82	97	92	92
% Coarse Sand (-No. 10, +No. 40)	10	7	7	13	9
% Fine Sand (-No. 40, +No. 200)	22	21	16	25	20
% Silt (0.075 - 0.002 mm)	35	32	43	35	35
% Clay (<0.002 mm)	24	23	30	20	28
% Finer than 0.02 mm	39	37	52	38	46
Frost Group	F3	F3	F3	F3	F3
Liquid Limit (-No. 40)	36	34	38	25	39
Plastic Limit (-No. 40)	14	14	16	10	12
Plasticity Index (-No. 40)	22	20	22	15	27
Soil Color	Brown	Brown	Brown	Brown	Brown
USCS Classification	CL	CL	CL	CL	CL
Soil Classification (AASHTO M-15)	A-6 (9)	A-6 (7)	A-6 (14)	A-6 (5)	A-6 (14)
Optimum Moisture (%)	9.0	10.0	10.0	9.0	10.0
Maximum Dry Density (pcf)	131.0	130.0	124.0	132.0	129.0

Depth (ft) (top 8 samples)	Moisture (%) (top 8 samples)									
1.0	11	1.0	14	1.0	14	1.0	8	3.0	10
2.0	9	2.0	17	2.0	9	2.0	5	4.0	10
3.0	14	3.0	26	3.0	7	3.0	4	5.0	11
4.0	14	4.0	19	4.0	8	4.0	4	6.0	11
5.0	14	5.0	15	5.0	9	5.0	6	7.0	10
6.0	14	6.0	14					8.0	10
7.0	15	7.0	13					9.0	10
8.0	15	8.0	16					10.0	20

Avg. Moisture of Sample Depth (all)	14	17	9	5	12

Linear Report of Tests on Soil Samples

PROJECT NO.: FA-12-00359
PROJECT: Williston NW Bypass
Highway 85
Williams County, North Dakota

Braun Intertec Corporation
PO Box 485, West Fargo, ND
Phone: (701) 232-8701

Boring Number	LSS-023	LSS-024	LSS-025	LSS-026	LSS-027
Northing	439371.36	439871.12	440370.16	440869.92	441369.55
Easting	1179588.63	1179576.81	1179547.45	1179539.35	1179555.55
Elevation	2101.6	2105.4	2100.9	2092.1	2087.7
Sample Depth	0.5' - 15'	2' - 7'	0.5' - 10'	0.5' - 10'	0.3' - 5'
% Passing 3/8" Sieve	98	98	99	99	99
% Passing No. 4 Sieve	96	95	96	97	95
% Passing No. 10 Sieve	94	89	91	93	90
% Coarse Sand (-No. 10, +No. 40)	6	14	8	9	10
% Fine Sand (-No. 40, +No. 200)	19	27	19	23	22
% Silt (0.075 - 0.002 mm)	34	31	35	34	38
% Clay (<0.002 mm)	35	17	29	27	21
% Finer than 0.02 mm	53	31	47	44	39
Frost Group	F3	F3	F3	F3	
Liquid Limit (-No. 40)	44	26	40	30	37
Plastic Limit (-No. 40)	13	13	13	11	16
Plasticity Index (-No. 40)	31	13	27	19	21
Soil Color	Brown	Brown	Brown	Brown	Dark Brown
USCS Classification	CL	SC	CL	CL	CL
Soil Classification (AASHTO M-15)	A-7-6 (19)	A-6 (3)	A-6 (14)	A-6 (8)	A-6 (10)
Optimum Moisture (%)	11.0	8.0	10.0	9.0	11.0
Maximum Dry Density (pcf)	127.0	137.0	129.0	132.0	123.0

Depth (ft) (top 8 samples)	Moisture (%) (top 8 samples)									
1.0	16	2.0	12	1.0	13	1.0	9	1.0	10
2.0	9	3.0	9	2.0	12	2.0	6	2.0	9
3.0	9	4.0	10	3.0	11	3.0	7	3.0	8
4.0	10	5.0	9	4.0	11	4.0	9	4.0	5
5.0	9	6.0	8	5.0	11	5.0	9		
6.0	10			6.0	10	6.0	10		
7.0	10			7.0	11	7.0	11		
8.0	11			8.0	12	8.0	12		
Avg. Moisture of Sample Depth (all)	11	10		11		9		8	

Linear Report of Tests on Soil Samples

PROJECT NO.: FA-12-00359
PROJECT: Williston NW Bypass
Highway 85
Williams County, North Dakota

Braun Intertec Corporation
PO Box 485, West Fargo, ND
Phone: (701) 232-8701

BRAUN INTERTEC

Boring Number		LSS-028		LSS-029		LSS-030	
Northing		441869.08		442368.53		442867.99	
Easting		1179576.65		1179597.71		1179618.93	
Elevation		2106.2		2112.2		2117.9	
Sample Depth		0.3' - 10'		0.3' - 15'		0.3' - 5'	
% Passing 3/8" Sieve		99		100		99	
% Passing No. 4 Sieve		96		99		98	
% Passing No. 10 Sieve		93		96		95	
% Coarse Sand (-No. 10, +No. 40)		7		7		8	
% Fine Sand (-No. 40, +No. 200)		19		20		26	
% Silt (0.075 - 0.002 mm)		39		40		36	
% Clay (<0.002 mm)		28		30		24	
% Finer than 0.02 mm		49		50		41	
Frost Group							
Liquid Limit (-No. 40)		44		41		34	
Plastic Limit (-No. 40)		14		14		13	
Plasticity Index (-No. 40)		30		27		21	
Soil Color		Brown		Brown		Brown	
USCS Classification		CL		CL		CL	
Soil Classification (AASHTO M-15)		A-7-6 (17)		A-7-6 (16)		A-6 (9)	
Optimum Moisture (%)		12.0		11.0		9.0	
Maximum Dry Density (pcf)		122.0		123.0		126.0	
Depth (ft) (top 8 samples)	Moisture (%) (top 8 samples)	1.0	19	1.0	17	1.0	6
		2.0	19	2.0	17	2.0	6
		3.0	19	3.0	17	3.0	6
		4.0	18	4.0	17	4.0	9
		5.0	18	5.0	17		
		6.0	18	6.0	17		
		7.0	18	7.0	18		
		8.0	18	8.0	18		
Avg. Moisture of Sample Depth (all)		18		17		7	

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-001**

LOCATION: Station 9676+00; N429505.595, E1181607.083 See Sketch.

DRILLER: S. Wenko | METHOD: Power Auger | DATE: **3/25/13** | SCALE: **1" = 4'**

Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
0.0						
0.6	BIT	7 inches of Bituminous Surfacing.				
	AGG	18 inches of Aggregate Base.			3	
2.1					10	
	FILL	FILL: Clayey Sand, trace Gravel, brown, moist. A-6 (3) MDD = 135.0 pcf; OMC = 7.0%.			12	LL=28, PL=13, PI=15; P200=48%
					14	
5.0					10	
		END OF BORING.				
		Bag sample collected from 2.1 to 5 feet.				
		Water not observed with 5 feet of power auger in the ground.				
		Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-002**

LOCATION: Station 9680+00; N429905.182, E1181623.211 See Sketch.

DRILLER: S. Wenko | METHOD: Power Auger | DATE: **3/25/13** | SCALE: **1" = 4'**

Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
0.0						
0.5	BIT	6 1/2 inches of Bituminous Surfacing.				
	AGG	18 inches of Aggregate Base.			4	
2.0					5	
	FILL	FILL: Clayey Sand with Gravel, brown, moist. A-2-6 (0) MDD = 136.0 pcf; OMC = 6.0%.			13	LL=24, PL=13, PI=11; P200=21%
					17	
					19	
5.0		END OF BORING.				
		Bag sample collected from 2 to 5 feet.				
		Water not observed with 5 feet of power auger in the ground.				
		Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-003**

LOCATION: Station 9685+00; N430404.711, E1181643.377 See Sketch.

DRILLER: S. Wenko | METHOD: Power Auger | DATE: **3/25/13** | SCALE: **1" = 4'**

Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
0.0						
0.6	BIT	7 inches of Bituminous Surfacing.				
	AGG	17 inches of Aggregate Base.			3	
2.0					6	
	FILL	FILL: Clayey Sand with Gravel, brown, moist. A-2-4 (0) MDD = 134.0 pcf; OMC = 6.0%.			16	LL=23, PL=14, PI=9; P200=17%
					16	
5.0					16	
		END OF BORING.				
		Bag sample collected from 2 to 5 feet.				
		Water not observed with 5 feet of power auger in the ground.				
		Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-004**

LOCATION: Station 9690+00; N430904.24, E1181663.52 See Sketch.

DRILLER: S. Wenko | METHOD: Power Auger | DATE: **3/25/13** | SCALE: **1" = 4'**

Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
0.0						
0.5	BIT	6 1/2 inches of Bituminous Surfacing.			4	
	AGG	17 inches of Aggregate Base.			3	
2.0	FILL	FILL: Clayey Sand with Gravel, brown, moist. A-2-6 (1) MDD = 133.0 pcf; OMC = 7.0%.			15	LL=28, PL=13, PI=15; P200=34%
					13	
5.0					12	
		END OF BORING.				
		Bag sample collected from 2 to 5 feet.				
		Water not observed with 5 feet of power auger in the ground.				
		Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-005**

LOCATION: Station 9695+00; N431403.733, E1181683.686 See Sketch.

DRILLER: S. Wenko | METHOD: Power Auger | DATE: **3/25/13** | SCALE: **1" = 4'**

Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
0.0						
0.5	BIT	6 1/2 inches of Bituminous Surfacing.			2	
	AGG	20 inches of Aggregate Base.			2	
2.5					7	
	FILL	FILL: Silty Sand with Gravel, fine- to coarse-grained, brown, moist. A-1-b (0) MDD = 138.0 pcf; OMC = 5.0%.			5	LL=NP, PL=NP, PI=NP; P200=18%
5.0					9	
		END OF BORING. Bag sample collected from 2.5 to 5 feet. Water not observed with 5 feet of power auger in the ground. Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-006**

LOCATION: Station 9700+00; N431903.262, E1181703.853 See Sketch.

DRILLER: S. Wenko | METHOD: Power Auger | DATE: **3/25/13** | SCALE: **1" = 4'**

Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
0.0						
0.5	BIT	6 1/2 inches of Bituminous Surfacing.				
	AGG	20 inches of Aggregate Base.			2	
2.2					3	
	FILL	FILL: Clayey Sand with Gravel, brown, moist. A-2-4 (0) MDD = 137.0 pcf; OMC = 6.0%.			13	LL=22, PL=14, PI=8; P200=15%
					18	
5.0					18	
		END OF BORING.				
		Bag sample collected from 2.2 to 5 feet.				
		Water not observed with 5 feet of power auger in the ground.				
		Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-008**

LOCATION: Station 9705+00; N432643.844, E1181734.235 See Sketch.

DRILLER: J. Brooks | METHOD: Power Auger | DATE: **3/12/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2087.7	0.0						
2086.7	1.0	FILL	FILL: Poorly Graded Sand, fine- to coarse-grained, with Gravel and Scoria, wet.			18	
		CL	SANDY LEAN CLAY, trace Gravel, brown, moist. A-6 (7) MDD = 135.0 pcf; OMC = 7.0%.			12	LL=31, PL=13, PI=18; P200=57%
						9	
						9	
						8	
						13	
						15	
						15	
						15	
2077.7	10.0					15	
			END OF BORING.				
			Bag sample collected from 1 to 10 feet.				
			Water not observed with 10 feet of power auger in the ground.				
			Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-010**

LOCATION: Station 9715+00; N433640.419, E1181852.831 See Sketch.

DRILLER: J. Brooks | METHOD: Power Auger | DATE: **3/12/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2093.9	0.0						
2092.9	1.0	FILL	FILL: Poorly Graded Sand, with Gravel, fine- to coarse-grained, brown and gray, moist.			6	
		FILL	FILL: Sandy Lean Clay, with Gravel, brown, moist.			14	
2090.9	3.0					14	
		CL	SANDY LEAN CLAY, trace Gravel, brown, moist. A-6 (5) MDD = 131.0 pcf; OMC = 9.0%.			20	LL=29, PL=14, PI=15; P200=56%
						11	
						9	
						9	
						16	
						14	
2083.9	10.0					14	
			END OF BORING. Bag sample collected from 3 to 10 feet. Water not observed with 10 feet of power auger in the ground. Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-011**

LOCATION: Station 9720+00; N434139.745, E1181806.274 See Sketch.

DRILLER: J. Brooks | METHOD: Power Auger | DATE: **3/12/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2093.9	0.0	FILL	FILL: Sandy Lean Clay, a little Gravel, brown, moist. A-6 (10) MDD = 131.0 pcf; OMC = 9.0%.			8	LL=34, PL=15, PI=19; P200=65%
						8	
						13	
						15	
						17	
2087.9	6.0					11	
		CL	SANDY LEAN CLAY, a little Gravel, brown, moist.			13	
						11	
						15	
2083.9	10.0					15	
			END OF BORING.				
			Bag sample collected from 0 to 6 feet.				
			Water not observed with 10 feet of power auger in the ground.				
			Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-012**

LOCATION: Station 9725+00; N434639.324, E1181877.998 See Sketch.

DRILLER: J. Brooks | METHOD: Power Auger | DATE: **3/12/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2092.0	0.0	FILL	FILL: Sandy Lean Clay, a little Gravel, brown, moist. A-6 (6) MDD = 131.0 pcf; OMC = 9.0%.			14	LL=31, PL=14 PI=17; P200=57%
						12	
						13	
2088.5	3.5					14	
		CL	SANDY LEAN CLAY, a little Gravel, brown, moist.			12	
						13	
						14	
						15	
						15	
2082.0	10.0					15	
			END OF BORING.				
			Bag sample collected from 0 to 10 feet.				
			Water not observed with 10 feet of power auger in the ground.				
			Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-013**

LOCATION: Station 9730+00; N435128.978, E1181754.635 See Sketch.

DRILLER: J. Brooks | METHOD: Power Auger | DATE: **3/12/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2091.2	0.0						
2090.2	1.0	CL	LEAN CLAY with SAND, trace Gravel, brown, wet.			18	
		CL	SANDY LEAN CLAY, trace Gravel, brown, moist to damp. A-7-6 (16) MDD = 126.0 pcf; OMC = 10.0%.			12	LL=42, PL=14, PI=28; P200=67%
						12	
						10	
						11	
						14	
						14	
						14	
						12	
2081.2	10.0					15	
			END OF BORING. Bag sample collected from 1 to 10 feet. Water not observed with 10 feet of power auger in the ground. Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-014**

LOCATION: Station 9735+00; N435577.16, E1181536.53 See Sketch.

DRILLER: J. Brooks | METHOD: Power Auger | DATE: **3/12/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2088.7	0.0						
2087.7	1.0	CL	SANDY LEAN CLAY, trace Gravel, brown, wet.			20	
		CL	SANDY LEAN CLAY, a little Gravel, brown, damp to moist. A-6 (12) MDD = 129.0 pcf; OMC = 9.0%.			12	LL=37, PL=13, PI=24; P200=63%
						11	
						16	
						16	
						7	
						15	
						15	
						16	
2078.7	10.0					17	
			END OF BORING. Bag sample collected from 1 to 10 feet. Water not observed with 10 feet of power auger in the ground. Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-015**

LOCATION: Station 9740+00; N435959.198, E1181215.262 See Sketch.

DRILLER: J. Brooks | METHOD: Power Auger | DATE: **3/12/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2083.9	0.0	FILL	FILL: Sandy Lean Clay, trace Gravel, brown, moist.			13	
						10	
2081.9	2.0	CL	SANDY LEAN CLAY, trace Gravel, brown, moist. A-6 (9) MDD = 133.0 pcf; OMC = 9.0%.			8	LL=32, PL=12, PI=20; P200=63%
						9	
						12	
						14	
						14	
						14	
						14	
2073.9	10.0					15	
			END OF BORING. Bag sample collected from 2 to 10 feet. Water not observed with 10 feet of power auger in the ground. Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-016**

LOCATION: Station 9745+00; N436324.658, E1180874.062 See Sketch.

DRILLER: J. Brooks | METHOD: Power Auger | DATE: **3/12/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2079.1	0.0	FILL	FILL: Sandy Lean Clay, trace Gravel, brown, moist.			13	
			-Organic, dark brown and black below 1 foot.			15	
2076.1	3.0					18	
		CL	SANDY LEAN CLAY, a little Gravel, brown, moist. A-6 (12) MDD = 131.0 pcf; OMC = 9.0%.			16	LL=39, PL=14, PI=25; P200=61%
						15	
						11	
						12	
						14	
						14	
2069.1	10.0					14	
			END OF BORING.				
			Bag sample collected from 3 to 10 feet.				
			Water not observed with 10 feet of power auger in the ground.				
			Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-017**

LOCATION: Station 9750+00; N436690.071, E1180532.972 See Sketch.

DRILLER: J. Brooks | METHOD: Power Auger | DATE: **3/12/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2074.0	0.0						
2073.0	1.0	CL	SANDY LEAN CLAY, a little Gravel, brown, moist.			16	
		CL	SANDY LEAN CLAY, trace Gravel, brown, moist. A-6 (14) MDD = 125.0 pcf; OMC = 11.0%.			12	LL=40, PL=15, PI=25; P200=66%
						12	
						15	
						15	
2068.0	6.0					15	
		CL	LEAN CLAY with SAND, trace Gravel, gray, moist.			19	
						17	
						15	
2064.0	10.0					14	
			END OF BORING.				
			Bag sample collected from 1 to 6 feet.				
			Water not observed with 10 feet of power auger in the ground.				
			Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-018**

LOCATION: Station 9755+00; N437055.533, E1180191.799 See Sketch.

DRILLER: J. Brooks | METHOD: Power Auger | DATE: **3/12/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2074.0	0.0						
2073.0	1.0	CL	SANDY LEAN CLAY, with Gravel, trace organics, brown, moist.			13	
		CL	SANDY LEAN CLAY, a little Gravel, brown, moist. A-6 (9) MDD = 131.0 pcf; OMC = 9.0%.			11	LL=36, PL=14, PI=22; P200=58%
						9	
						14	
						14	
						14	
						14	
						15	
						15	
						18	
2064.0	10.0		END OF BORING.				
			Bag sample collected from 1 to 10 feet.				
			Water not observed with 10 feet of power auger in the ground.				
			Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-019**

LOCATION: Station 9760+00; N437434.568, E1179866.717 See Sketch.

DRILLER: J. Brooks | METHOD: Power Auger | DATE: **3/12/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2074.2	0.0						
2073.2	1.0	CL	SANDY LEAN CLAY, trace Gravel and organics, brown, moist.			12	
		CL	SANDY LEAN CLAY, a little Gravel, brown, moist. A-6 (7) MDD = 130.0 pcf; OMC = 10.0%.			14	LL=34, PL=14, PI=20; P200=55%
			-wet at 3 feet.			17	
						26	
						19	
						15	
						14	
						13	
						16	
2064.2	10.0					16	
			END OF BORING. Bag sample collected from 1 to 10 feet. Water not observed with 10 feet of power auger in the ground. Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-020**

LOCATION: Station 9765+00; N437881.391, E1179646.293 See Sketch.

DRILLER: J. Brooks | METHOD: Power Auger | DATE: **3/12/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2077.0	0.0						
2076.0	1.0	FILL	FILL: Lean Clay with Sand, trace Gravel, roots and Organics, brown, wet.			16	
		CL	LEAN CLAY with SAND, trace Gravel, brown, moist to damp. A-6 (14) MDD = 124.0 pcf; OMC = 10.0%.			14	LL=38, PL=16, PI=22; P200=74%
						9	
						7	
						8	
2071.0	6.0					9	
		CL	SANDY LEAN CLAY, a little Gravel, brown, damp.			9	
						8	
						8	
						10	
						9	
						11	
						11	
						11	
2062.0	15.0					11	
			END OF BORING. Bag sample collected from 1 to 6 feet. Water not observed with 15 feet of power auger in the ground. Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-021**

LOCATION: Station 9770+00; N438372.068, E1179559.86 See Sketch.

DRILLER: J. Brooks | METHOD: Power Auger | DATE: **3/12/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2088.2	0.0						
2087.7	0.5	CL	SANDY LEAN CLAY, with Gravel, roots and Organics, brown and black, moist.			15	LL=25, PL=10, PI=15; P200=55%
		CL	(Topsoil)			8	
			SANDY LEAN CLAY, trace Gravel, brown, damp. A-6 (5) MDD = 132.0 pcf; OMC = 9.0%.			5	
						4	
						4	
2082.2	6.0					6	
		CL	SANDY LEAN CLAY, a little Gravel, brown and light gray, moist.			12	
						11	
						13	
						12	
						15	
						14	
						14	
						13	
2073.2	15.0					14	
			END OF BORING.				
			Bag sample collected from 0.5 to 6 feet.				
			Water not observed with 15 feet of power auger in the ground.				
			Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-022**

LOCATION: Station 9775+00; N438871.648, E1179575.021 See Sketch.

DRILLER: J. Brooks | METHOD: Power Auger | DATE: **3/12/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2094.5	0.0	CH	FAT CLAY, a little Gravel, brown, wet.			28	
						26	
2091.5	3.0					25	
		CL	SANDY LEAN CLAY, trace Gravel, brown, moist. A-6 (14) MDD = 129.0 pcf; OMC = 10.0%.			10	LL=39, PL=12, PI=27; P200=63%
						10	
						11	
						11	
						10	
						10	
						10	
			-wet layer at 10 feet.			20	
						12	
						11	
						12	
2079.5	15.0					11	
		SP	POORLY GRADED SAND, fine-grained, trace Gravel, brown, damp.			3	
						3	
						2	
						2	
2074.5	20.0					2	
			END OF BORING.				
			Bag sample collected from 3 to 15 feet.				
			Water not observed with 20 feet of power auger in the ground.				
			Driller noted standing water in ditch.				
			Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-023**

LOCATION: Station 9780+00; N439371.358, E1179588.631 See Sketch.

DRILLER: J. Brooks | METHOD: Power Auger | DATE: **3/12/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2101.6	0.0						
2101.1	0.5	CL	LEAN CLAY with SAND, roots and Organics, trace Gravel, brown, wet.			19	LL=44, PL=13, PI=31; P200=69%
		CL	SANDY LEAN CLAY, trace Gravel, brown, moist to damp. A-7-6 (19) MDD = 127.0 pcf; OMC = 11.0%.			16	
						9	
						9	
						10	
						9	
						10	
						10	
						11	
						10	
						10	
						10	
						11	
						11	
2086.6	15.0					11	
			END OF BORING.				
			Bag sample collected from 0.5 to 15 feet.				
			Water not observed with 15 feet of power auger in the ground.				
			Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-024**

LOCATION: Station 9785+00; N439871.117, E1179576.81 See Sketch.

DRILLER: J. Brooks | METHOD: Power Auger | DATE: **3/12/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2105.4	0.0	FILL	FILL: Sandy Lean Clay, trace Gravel, brown, wet.			12	
						9	
2103.4	2.0	SC	CLAYEY SAND, a little Gravel, brown, moist. A-6 (3) MDD = 137.0 pcf; OMC = 8.0%.			12	LL=26, PL=13, PI=13; P200=48%
						9	
						10	
						9	
2098.4	7.0					8	
		CL	SANDY LEAN CLAY, trace Gravel, brown, moist.			14	
						14	
2095.4	10.0					13	
			END OF BORING.				
			Bag sample collected from 2 to 7 feet.				
			Water not observed with 10 feet of power auger in the ground.				
			Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-025**

LOCATION: Station 9790+00; N440370.162, E1179547.453 See Sketch.

DRILLER: J. Brooks | METHOD: Power Auger | DATE: **3/12/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2100.9	0.0						
2100.4	0.5	CL	SANDY LEAN CLAY, trace Gravel, roots and Organics, brown, wet.			13	LL=40, PL=13, PI=27; P200=64%
		CL	SANDY LEAN CLAY, trace Gravel, brown, moist. A-6 (14) MDD = 129.0 pcf; OMC = 10.0%.			13 12 11 11 11 10 11 12	
2090.9	10.0					11	
			END OF BORING. Bag sample collected from 0.5 to 10 feet. Water not observed with 10 feet of power auger in the ground. Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-026**

LOCATION: Station 9795+00; N440869.915, E1179539.35 See Sketch.

DRILLER: J. Brooks | METHOD: Power Auger | DATE: **3/12/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2092.1	0.0						
2091.6	0.5	CL	SANDY LEAN CLAY, trace Gravel, roots and Organics, brown, wet.			16	LL=30, PL=11, PI=19; P200=61%
		CL	SANDY LEAN CLAY, trace Gravel, brown, moist to damp. A-6 (8) MDD = 132.0 pcf; OMC = 9.0%.			9	
						6	
						7	
						9	
						9	
						10	
						11	
						12	
2082.1	10.0					12	
			END OF BORING. Bag sample collected from 0.5 to 10 feet. Water not observed with 10 feet of power auger in the ground. Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-027**

LOCATION: Station 9800+00; N441369.552, E1179555.546 See Sketch.

DRILLER: C. Elliot | METHOD: Power Auger | DATE: **3/23/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2087.7	0.0						
2087.4	0.3	CL	SANDY LEAN CLAY, with roots and organics, black, moist.			11	LL=37, PL=16, PI=21; P200=60%
		CL	SANDY LEAN CLAY, trace Gravel, dark brown, damp. A-6 (10) MDD = 123.0 pcf; OMC = 11.0%.			10	
						9	
						8	
2082.7	5.0					5	
		CL	SANDY LEAN CLAY, trace Gravel, brown, moist.			14	
						13	
						15	
						15	
						16	
						18	
						18	
						18	
						18	
						17	
						18	
						18	
						18	
						18	
2067.7	20.0					17	
			END OF BORING.				
			Bag sample collected from 0.3 to 5 feet.				
			Water not observed with 20 feet of power auger in the ground.				
			Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:11

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-028**

LOCATION: Station 9805+00; N441869.078, E1179576.648 See Sketch.

DRILLER: C. Elliot | METHOD: Power Auger | DATE: **3/23/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2106.2	0.0						
2105.9	0.3	CL	SANDY LEAN CLAY, with roots and organics, black, moist.			19	LL=44, PL=14, PI=30; P200=67%
		CL	SANDY LEAN CLAY, trace Gravel, brown, moist. A-7-6 (17) MDD = 122.0 pcf; OMC = 12.0%.			19	
						19	
						18	
						18	
						18	
						18	
						18	
2096.2	10.0					18	
			END OF BORING. Bag sample collected from 0.3 to 10 feet. Water not observed with 10 feet of power auger in the ground. Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:12

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-029**

LOCATION: Station 9810+00; N442368.53, E1179597.711 See Sketch.

DRILLER: C. Elliot | METHOD: Power Auger | DATE: **3/23/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2112.2	0.0						
2111.9	0.3	CL	SANDY LEAN CLAY, with roots and organics, black, moist.			17	LL=41, PL=14, PI=27; P200=69%
		CL	SANDY LEAN CLAY, trace Gravel, brown, moist. A-7-6 (16) MDD = 123.0 pcf; OMC = 11.0%.			17	
						17	
						17	
						17	
						17	
						17	
						18	
						18	
						17	
						16	
						16	
						17	
						16	
2097.2	15.0					16	
			END OF BORING.				
			Bag sample collected from 0.3 to 15 feet.				
			Water not observed with 15 feet of power auger in the ground.				
			Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:12

BRAUN INTERTEC

LOG OF BORING

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: **LSS-030**

LOCATION: Station 9815+00; N442867.989, E1179618.927 See Sketch.

DRILLER: C. Elliot | METHOD: Power Auger | DATE: **3/23/13** | SCALE: **1" = 4'**

Elev. feet	Depth feet	ASTM Symbol	Description of Materials (ASTM D2488 or D2487)	BPF	WL	MC %	Tests or Notes
2117.9	0.0						
2117.6	0.3	CL	SANDY LEAN CLAY, with roots and organics, black, moist.			7	LL=34, PL=13, PI=21; P200=60%
		CL	SANDY LEAN CLAY, trace Gravel, brown, damp. A-6 (9) MDD = 126.0 pcf; OMC = 9.0%.			6	
						6	
						6	
2112.9	5.0					9	
		CL	SANDY LEAN CLAY, trace Gravel, brown, moist.			14	
						15	
						15	
						15	
2107.9	10.0					14	
			END OF BORING.				
			Bag sample collected from 0.3 to 5 feet.				
			Water not observed with 10 feet of power auger in the ground.				
			Boring then backfilled.				

(See Descriptive Terminology sheet for explanation of abbreviations)

NDDOT LOG 00359.GPJ BRAUN.GDT 4/17/13 10:12

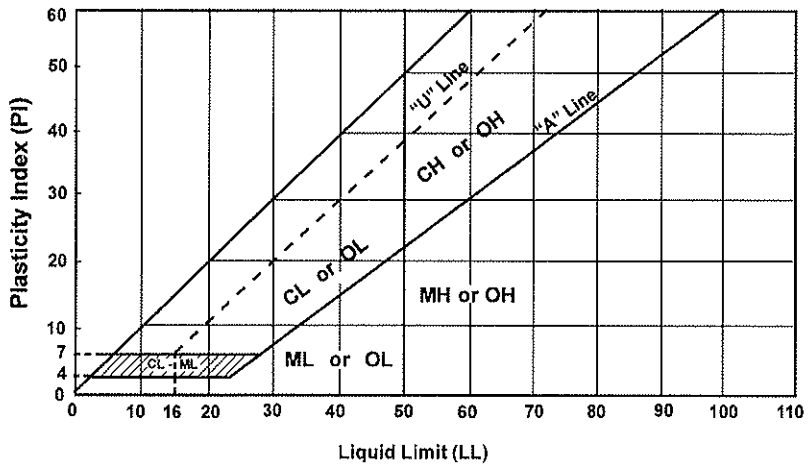
BRAUN
INTERTEC

Descriptive Terminology of Soil

Standard D 2487 - 00
Classification of Soils for Engineering Purposes
(Unified Soil Classification System)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [a]				Soils Classification	
				Group Symbol	Group Name [b]
Coarse-grained Soils more than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels 5% or less fines [e]	$C_u \geq 4$ and $1 \leq C_c \leq 3$ [c]	GW	Well-graded gravel [d]
			$C_u < 4$ and/or $1 > C_c > 3$ [c]	GP	Poorly graded gravel [d]
		Gravels with Fines More than 12% fines [e]	Fines classify as ML or MH	GM	Silty gravel [d f g]
			Fines classify as CL or CH	GC	Clayey gravel [d f g]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands 5% or less fines [i]	$C_u \geq 6$ and $1 \leq C_c \leq 3$ [c]	SW	Well-graded sand [h]
			$C_u < 6$ and/or $1 > C_c > 3$ [c]	SP	Poorly graded sand [h]
		Sands with Fines More than 12% [i]	Fines classify as ML or MH	SM	Silty sand [f g h]
			Fines classify as CL or CH	SC	Clayey sand [f g h]
Fine-grained Soils 50% or more passed the No. 200 sieve	Silts and Clays Liquid limit less than 50	Inorganic	PI > 7 and plots on or above "A" line [j]	CL	Lean clay [k l m]
			PI < 4 or plots below "A" line [j]	ML	Silt [k l m]
		Organic	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OL	Organic clay [k l m n]
				OL	Organic silt [k l m o]
	Silts and clays Liquid limit 50 or more	Inorganic	PI plots on or above "A" line	CH	Fat clay [k l m]
			PI plots below "A" line	MH	Elastic silt [k l m]
		Organic	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OH	Organic clay [k l m p]
				OH	Organic silt [k l m q]
Highly Organic Soils		Primarily organic matter, dark in color and organic odor		PT	Peat

a. Based on the material passing the 3-in (75mm) sieve.
b. If field sample contained cobbles or boulders, or both, add "with cobbles or boulders or both" to group name.
c. $C_u = D_{60} / D_{10}$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
d. If soil contains ≥15% sand, add "with sand" to group name.
e. Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay
f. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
g. If fines are organic, add "with organic fines" to group name.
h. If soil contains ≥ 15% gravel, add "with gravel" to group name.
i. Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay
j. If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.
k. If soil contains 10 to 29% plus No. 200, add "with sand" or "with gravel" whichever is predominant.
l. If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name.
m. If soil contains ≥ 30% plus No. 200 predominantly gravel, add "gravelly" to group name.
n. PI ≥ 4 and plots on or above "A" line.
o. PI < 4 or plots below "A" line.
p. PI plots on or above "A" line.
q. PI plots below "A" line.



Laboratory Tests

DD	Dry density, pcf	OC	Organic content, %
WD	Wet density, pcf	S	Percent of saturation, %
MC	Natural moisture content, %	SG	Specific gravity
LL	Liquid limit, %	C	Cohesion, psf
PL	Plastic limit, %	∅	Angle of internal friction
PI	Plasticity index, %	qu	Unconfined compressive strength, psf
P200	% passing 200 sieve	qp	Pocket penetrometer strength, tsf

Particle Size Identification

Boulders	over 12"
Cobbles	3" to 12"
Gravel	
Coarse	3/4" to 3"
Fine	No. 4 to 3/4"
Sand	
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Silt	< No. 200, PI < 4 or below "A" line
Clay	< No. 200, PI ≥ 4 and on or above "A" line

Relative Density of Cohesionless Soils

Very loose	0 to 4 BPF
Loose	5 to 10 BPF
Medium dense	11 to 30 BPF
Dense	31 to 50 BPF
Very dense	over 50 BPF

Consistency of Cohesive Soils

Very soft	0 to 1 BPF
Soft	2 to 3 BPF
Rather soft	4 to 5 BPF
Medium	6 to 8 BPF
Rather stiff	9 to 12 BPF
Stiff	13 to 16 BPF
Very stiff	17 to 30 BPF
Hard	over 30 BPF

Drilling Notes

Standard penetration test borings were advanced by 3 1/4" or 6 1/4" ID hollow-stem augers unless noted otherwise, Jetting water was used to clean out auger prior to sampling only where indicated on logs. Standard penetration test borings are designated by the prefix "ST" (Split Tube). All samples were taken with the standard 2" OD split-tube sampler, except where noted.

Power auger borings were advanced by 4" or 6" diameter continuous-flight, solid-stem augers. Soil classifications and strata depths were inferred from disturbed samples augered to the surface and are, therefore, somewhat approximate. Power auger borings are designated by the prefix "B."

Hand auger borings were advanced manually with a 1 1/2" or 3 1/4" diameter auger and were limited to the depth from which the auger could be manually withdrawn. Hand auger borings are indicated by the prefix "H."

BPF: Numbers indicate blows per foot recorded in standard penetration test, also known as "N" value. The sampler was set 6" into undisturbed soil below the hollow-stem auger. Driving resistances were then counted for second and third 6" increments and added to get BPF. Where they differed significantly, they are reported in the following form: 2/12 for the second and third 6" increments, respectively.

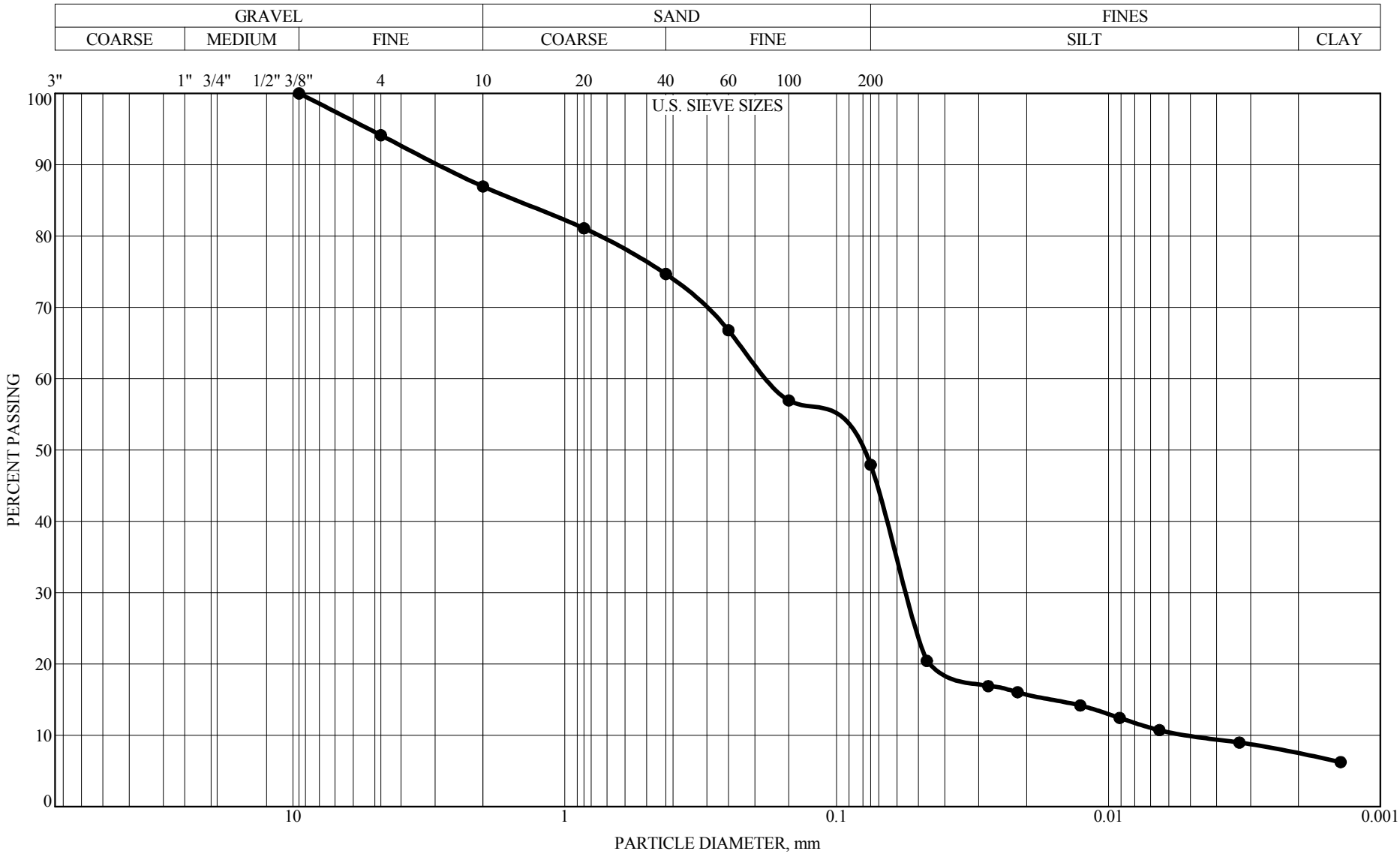
WH: WH indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

WR: WR indicates the sampler penetrated soil under weight of rods alone; hammer weight and driving not required.

TW indicates thin-walled (undisturbed) tube sample.

Note: All tests were run in general accordance with applicable ASTM standards.

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-001 DEPTH: 2.1'-5.0'

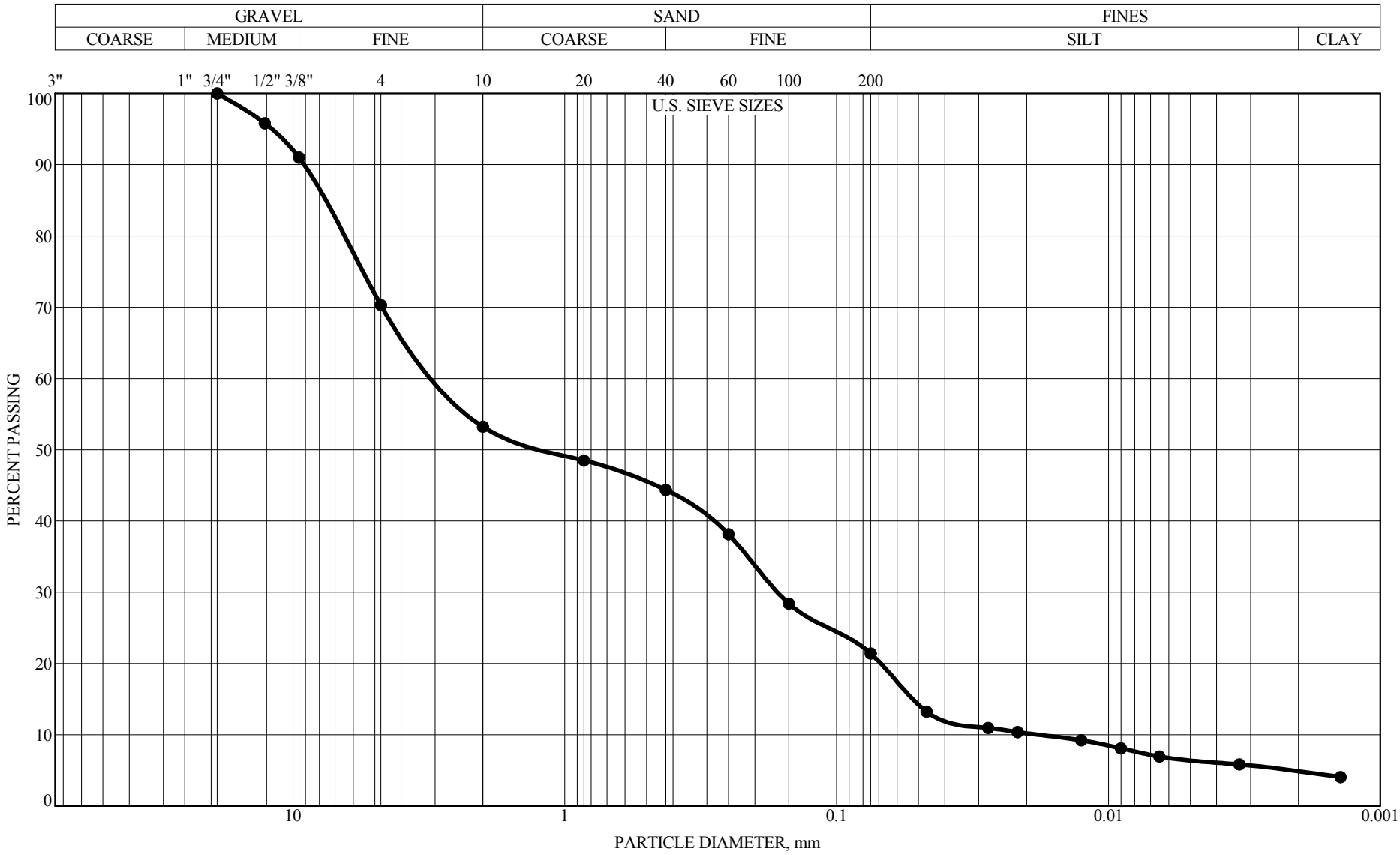
GRAVEL	13.0%
SAND	39.0%
SILT	40.5%
CLAY	7.4%

CLASSIFICATION:
A-6 (3), Brown
CLAYEY SAND(SC)

LL=28, PL=13, PI=15; P200=48%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-002 DEPTH: 2.0'-5.0'

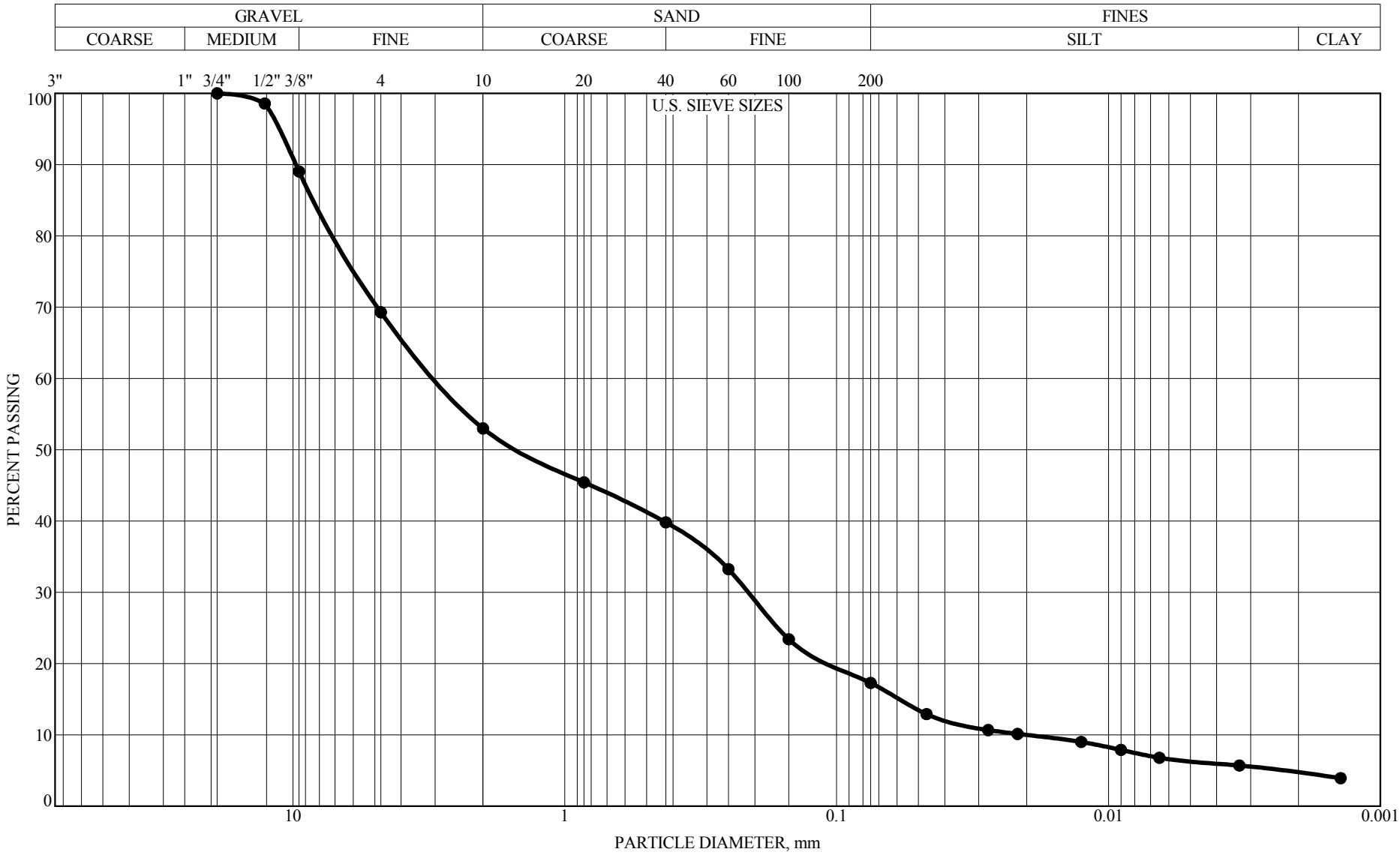
GRAVEL	46.8%
SAND	31.8%
SILT	16.6%
CLAY	4.8%

CLASSIFICATION:
A-2-6 (0), Brown
CLAYEY SAND with GRAVEL(SC)

LL=24, PL=13, PI=11; P200=21%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-003 DEPTH: 2.0'-5.0'

GRAVEL	47.0%
SAND	35.7%
SILT	12.6%
CLAY	4.7%

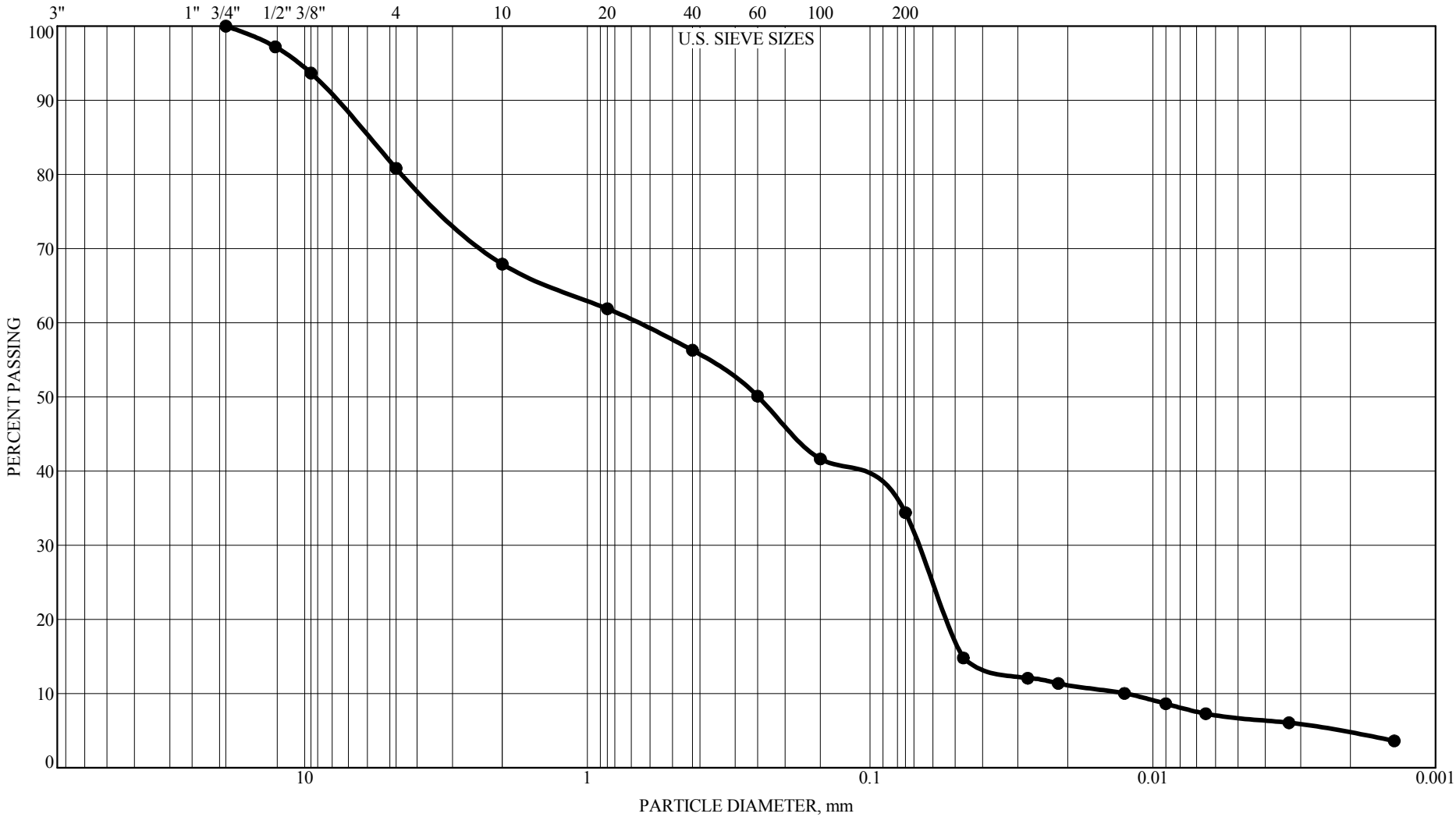
CLASSIFICATION:
A-2-4 (0), Brown
CLAYEY SAND with GRAVEL(SC)

LL=23, PL=14, PI=9; P200=17%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)

GRAVEL			SAND		FINES	
COARSE	MEDIUM	FINE	COARSE	FINE	SILT	CLAY



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-004 DEPTH: 2.0'-5.0'

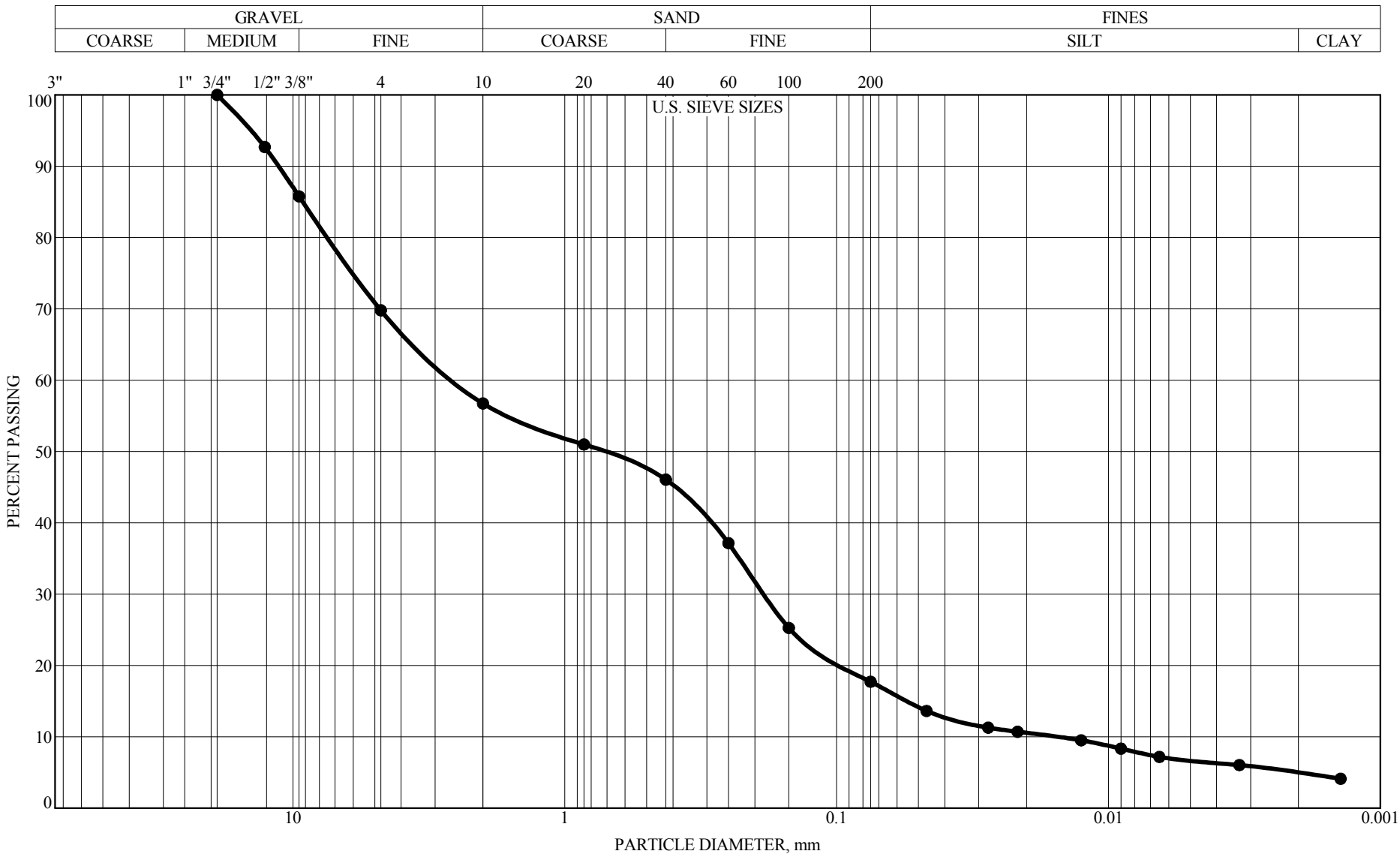
GRAVEL	32.1%
SAND	33.5%
SILT	29.8%
CLAY	4.6%

CLASSIFICATION:
A-2-6 (1), Brown
CLAYEY SAND with GRAVEL(SC)

LL=28, PL=13, PI=15; P200=34%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-005 DEPTH: 2.5'-5.0'

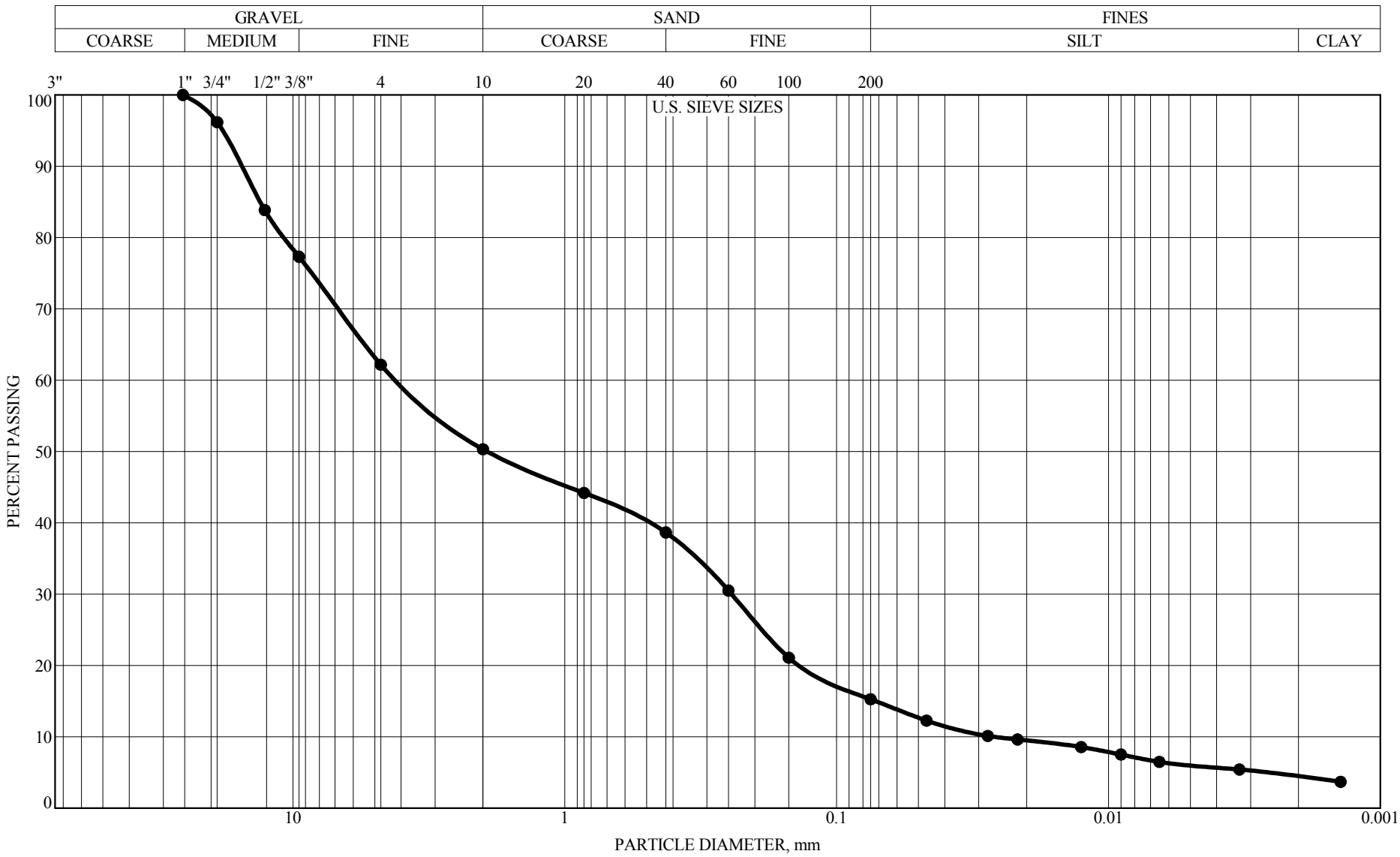
GRAVEL	43.3%
SAND	39.0%
SILT	12.8%
CLAY	4.9%

CLASSIFICATION:
A-1-b (0), Brown
SILTY SAND with GRAVEL(SM)

LL=NP, PL=NP, PI=NP; P200=18%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-006 DEPTH: 2.2'-5.0'

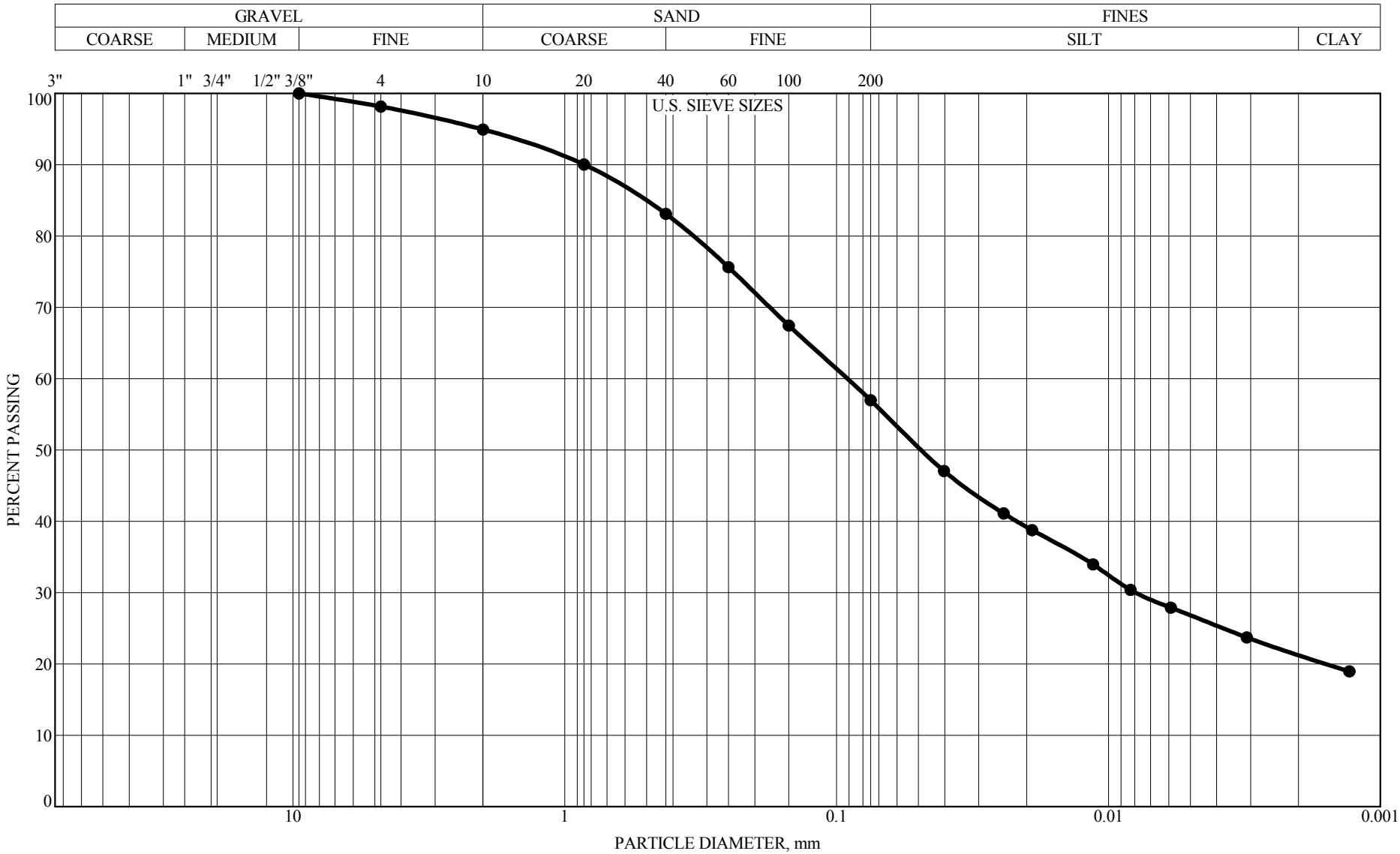
GRAVEL	49.7%
SAND	35.1%
SILT	10.9%
CLAY	4.4%

CLASSIFICATION:
A-2-4 (0), Brown
CLAYEY SAND with GRAVEL(SC)

LL=22, PL=14, PI=8; P200=15%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-008 DEPTH: 1.0'-10.0'

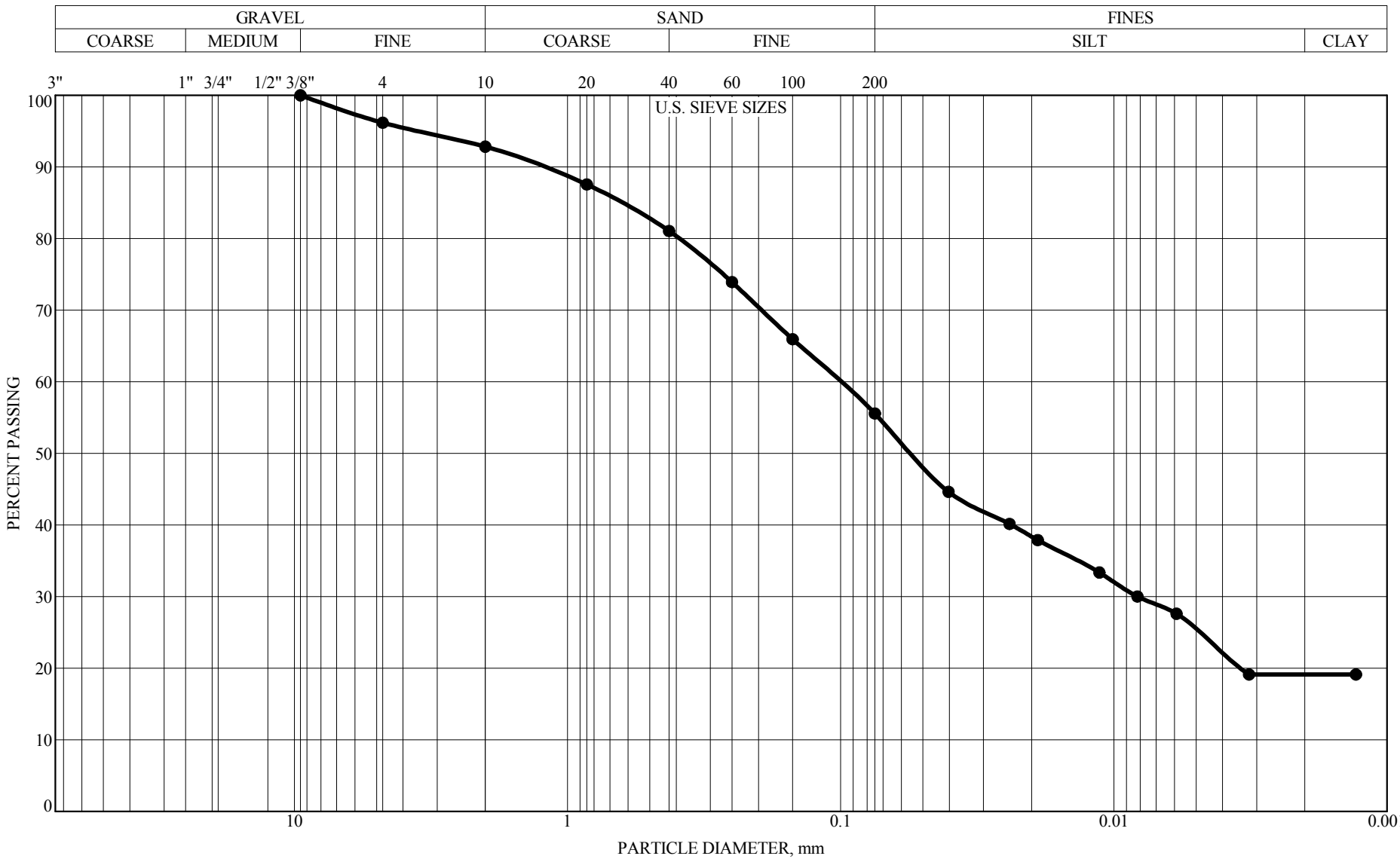
GRAVEL	5.1%
SAND	37.9%
SILT	35.7%
CLAY	21.3%

CLASSIFICATION:
A-6 (7), Brown
SANDY LEAN CLAY(CL)

LL=31, PL=13, PI=18; P200=57%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-010 DEPTH: 3.0'-10.0'

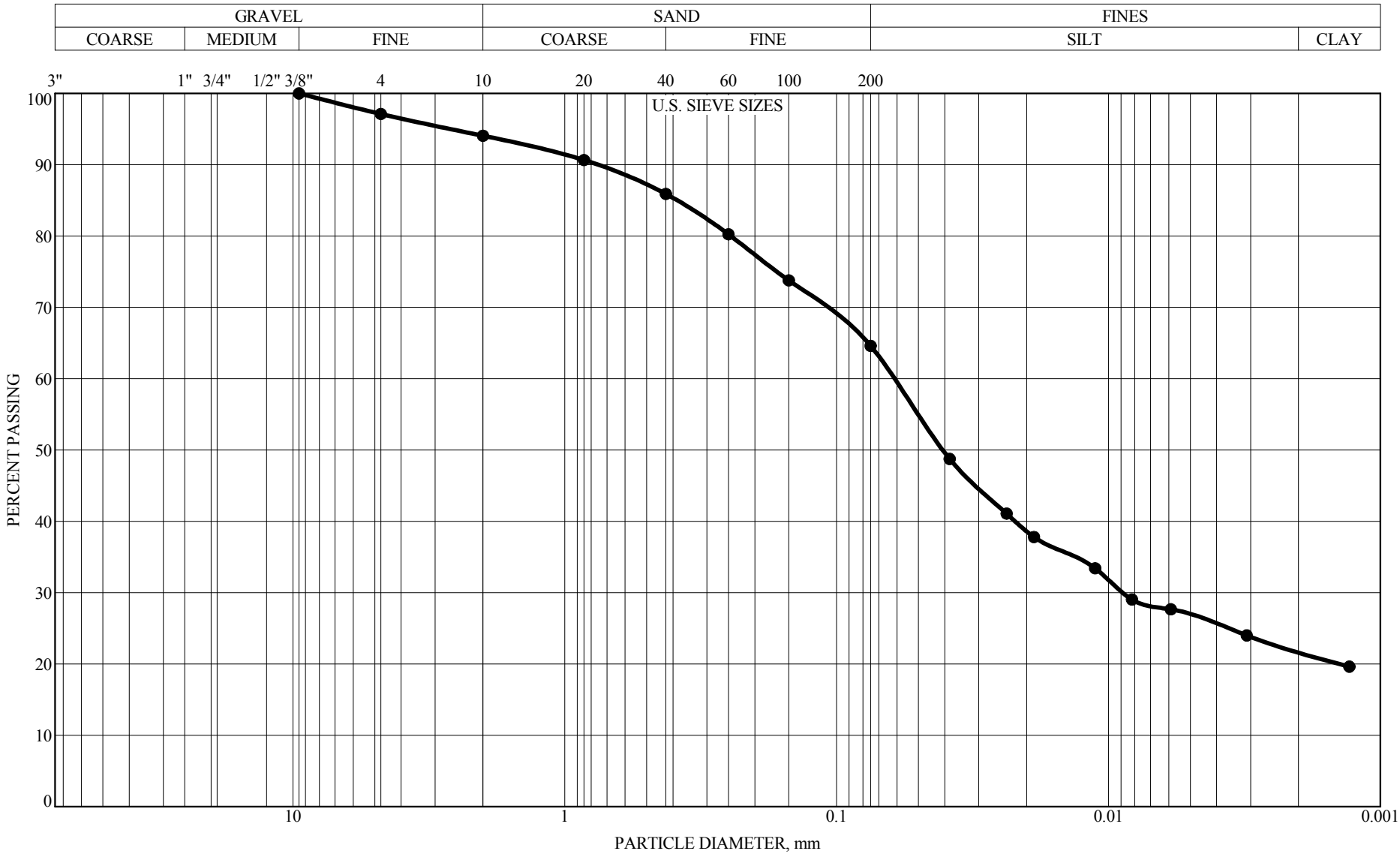
GRAVEL	7.2%
SAND	37.3%
SILT	36.4%
CLAY	19.1%

CLASSIFICATION:
A-6 (5), Brown
SANDY LEAN CLAY(CL)

LL=29, PL=14, PI=15; P200=56%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-011 DEPTH: 0.0'-6.0'

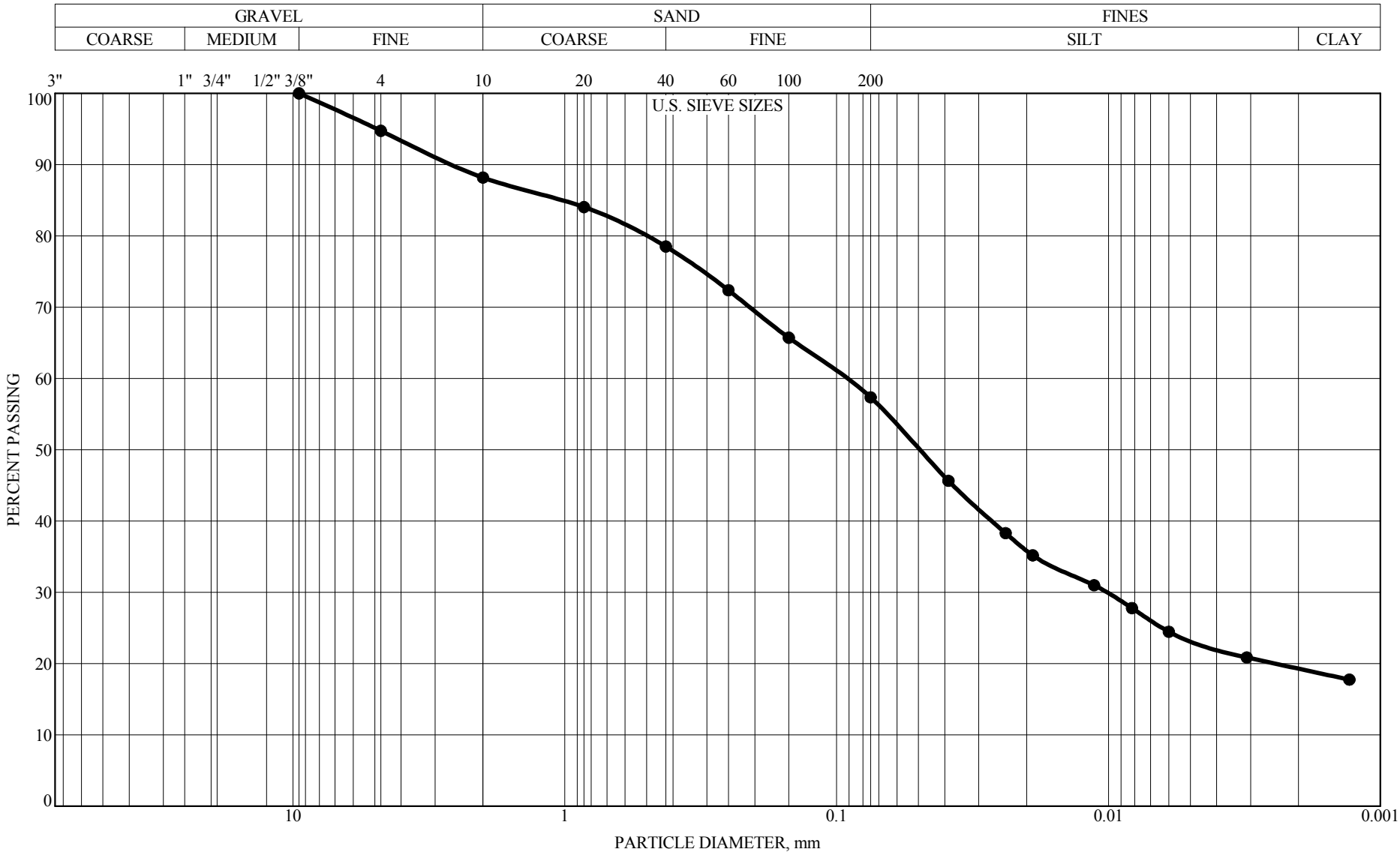
GRAVEL	5.9%
SAND	29.5%
SILT	42.8%
CLAY	21.8%

CLASSIFICATION:
A-6 (10), Brown
SANDY LEAN CLAY(CL)

LL=34, PL=15, PI=19; P200=65%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-012 DEPTH: 0.0'-10.0'

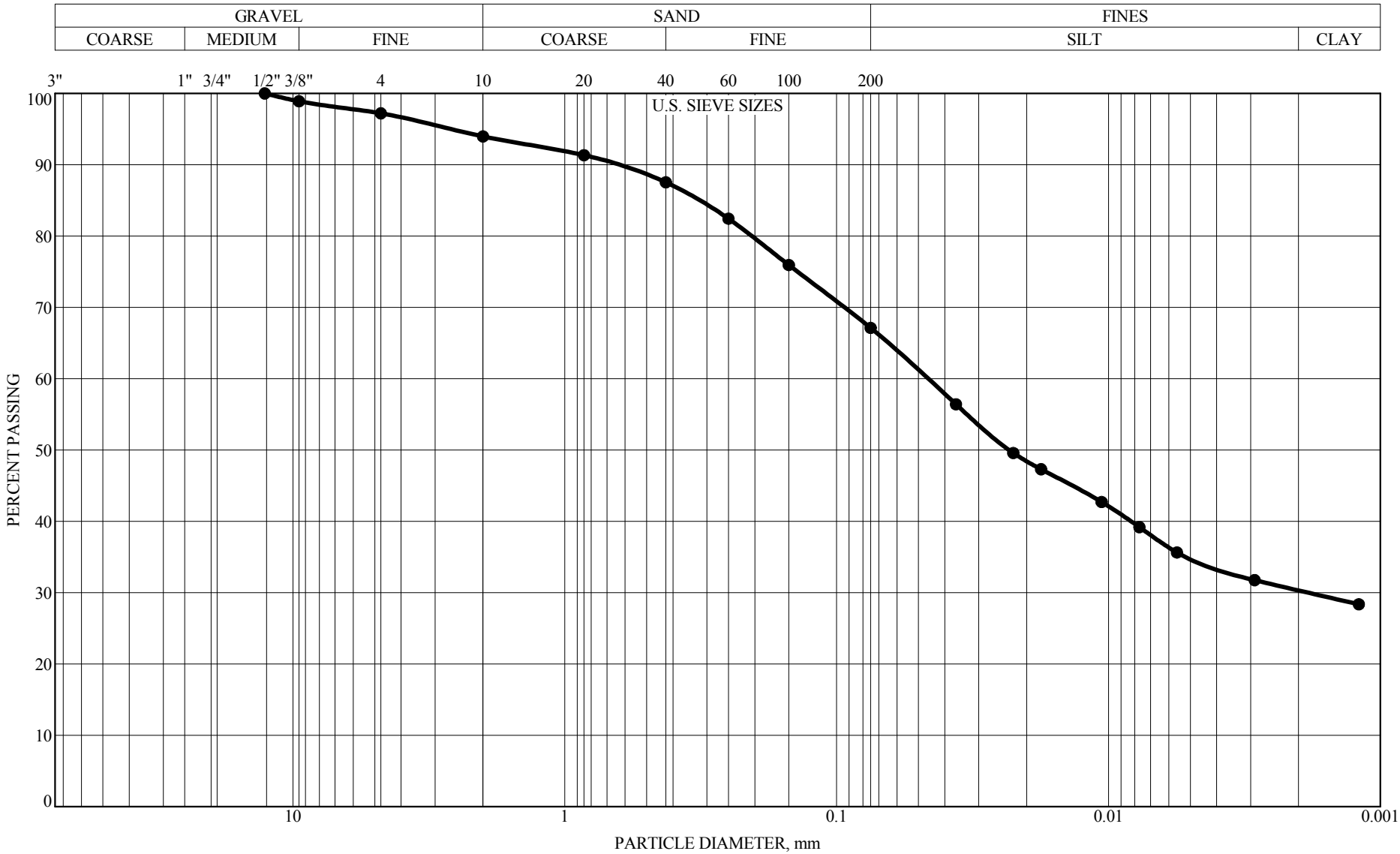
GRAVEL	11.8%
SAND	30.8%
SILT	38.1%
CLAY	19.3%

CLASSIFICATION:
A-6 (6), Brown
SANDY LEAN CLAY(CL)

LL=31, PL=14 PI=17; P200=57%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-013 DEPTH: 1.0'-10.0'

GRAVEL	6.0%
SAND	26.8%
SILT	36.8%
CLAY	30.3%

CLASSIFICATION:
A-7-6 (16), Brown
SANDY LEAN CLAY(CL)

LL=42, PL=14, PI=28; P200=67%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)

BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-014 DEPTH: 1.0'-10.0'

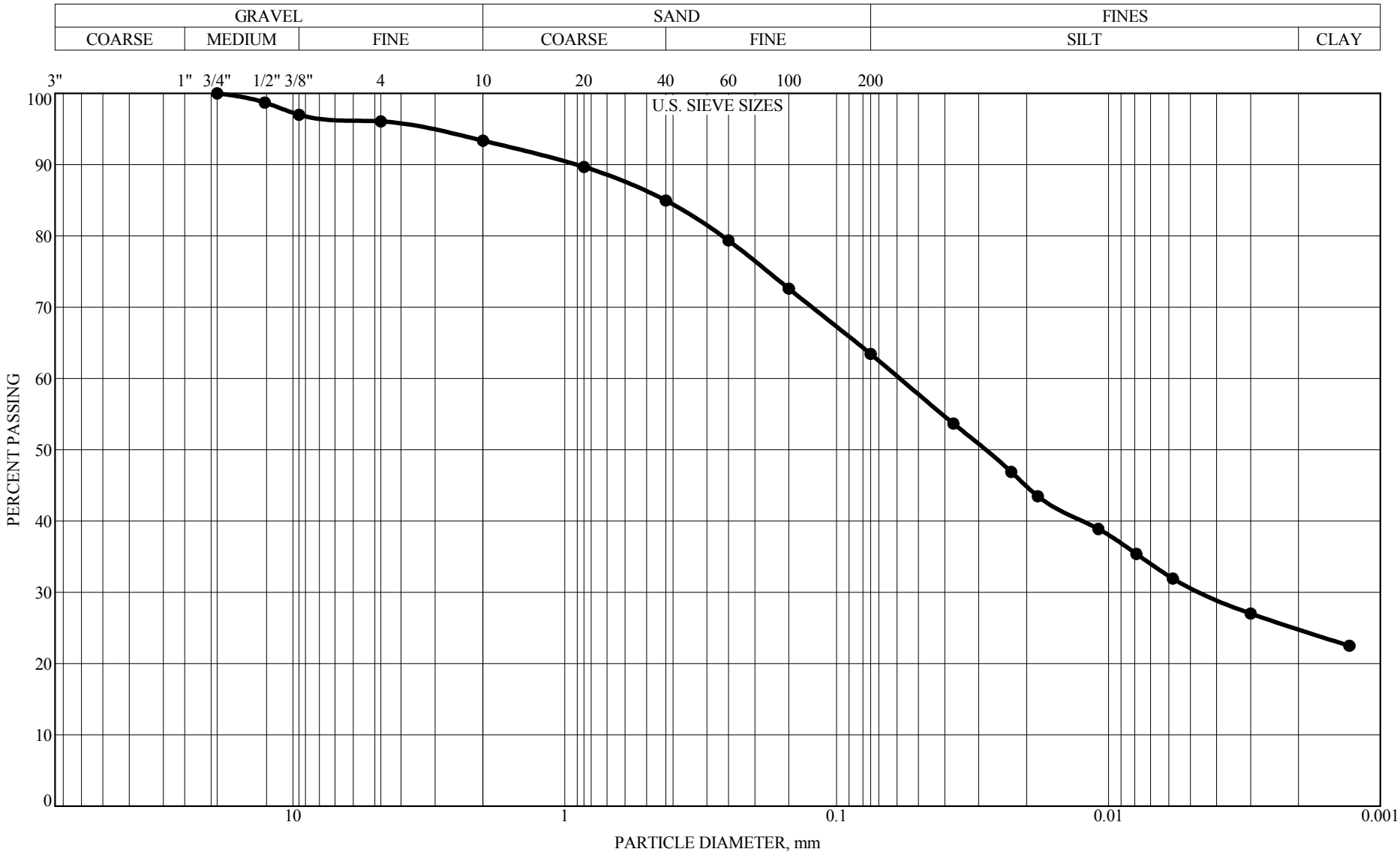
GRAVEL	7.1%
SAND	29.6%
SILT	38.1%
CLAY	25.2%

CLASSIFICATION:
A-6 (12), Brown
SANDY LEAN CLAY(CL)

LL=37, PL=13, PI=24; P200=63%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-015 DEPTH: 2.0'-10.0'

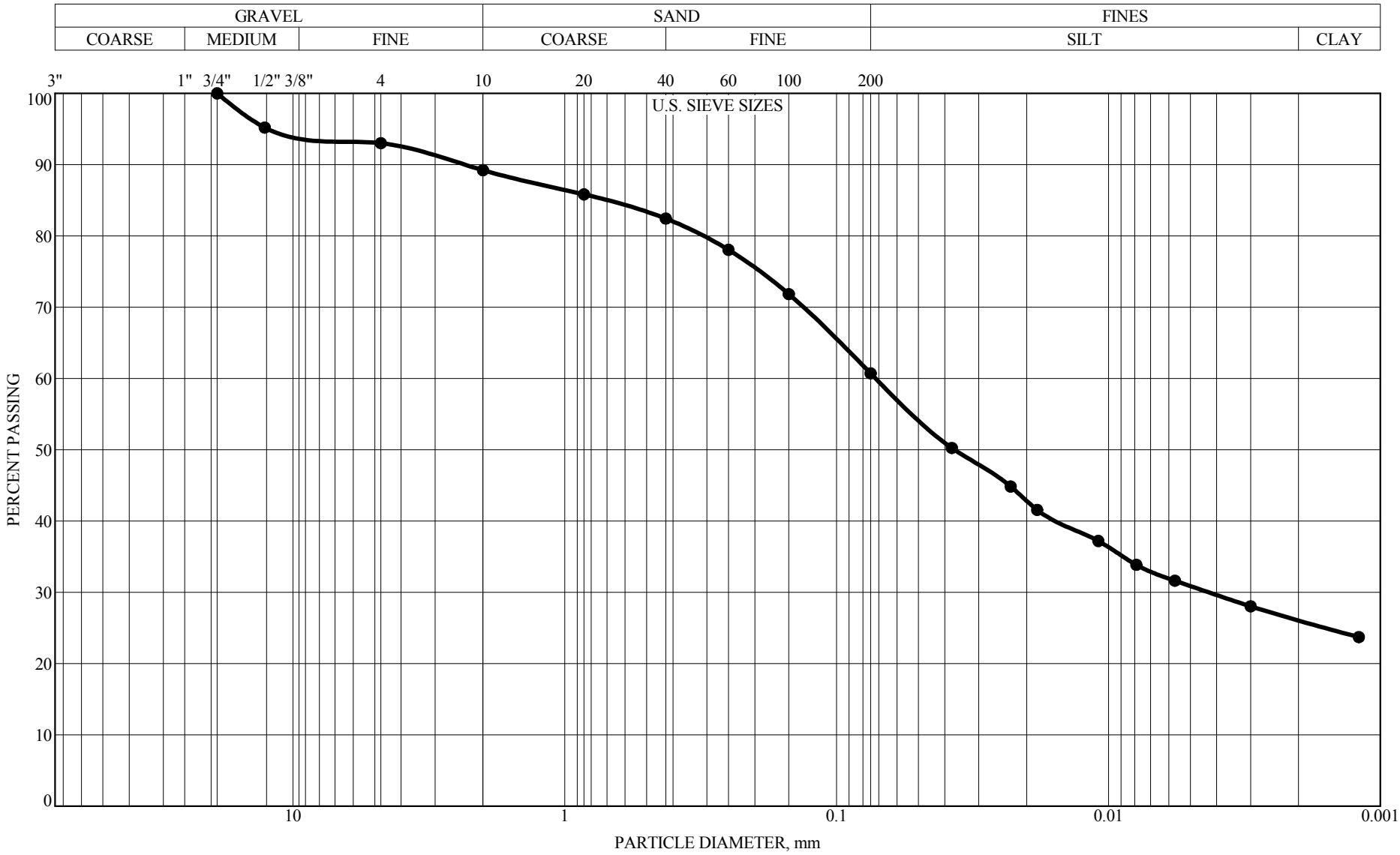
GRAVEL	6.6%
SAND	29.9%
SILT	38.6%
CLAY	24.8%

CLASSIFICATION:
A-6 (9), Brown
SANDY LEAN CLAY(CL)

LL=32, PL=12, PI=20; P200=63%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-016 DEPTH: 3.0'-10.0'

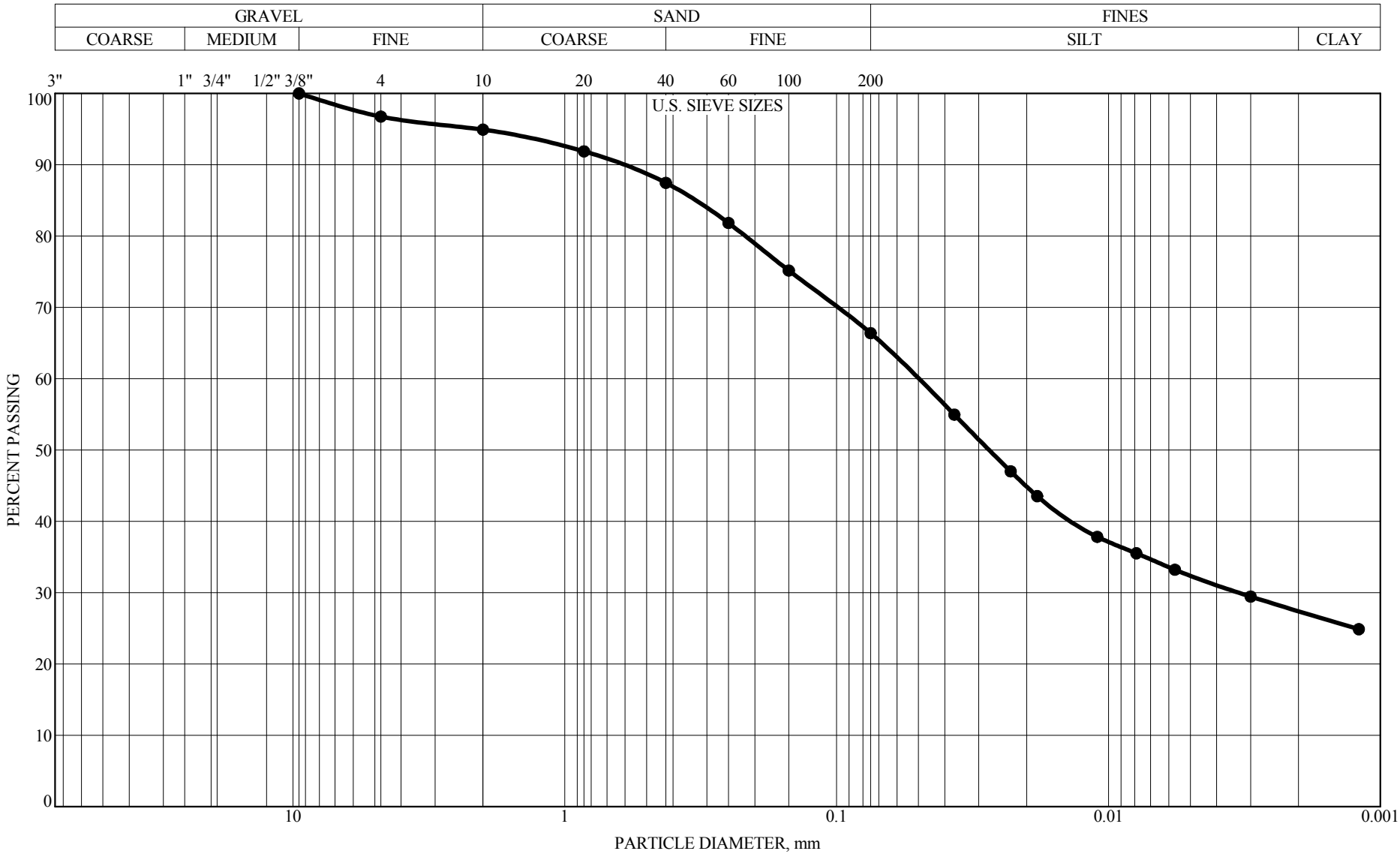
GRAVEL	10.8%
SAND	28.5%
SILT	34.6%
CLAY	26.1%

CLASSIFICATION:
A-6 (12), Brown
SANDY LEAN CLAY(CL)

LL=39, PL=14, PI=25; P200=61%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-017 DEPTH: 1.0'-6.0'

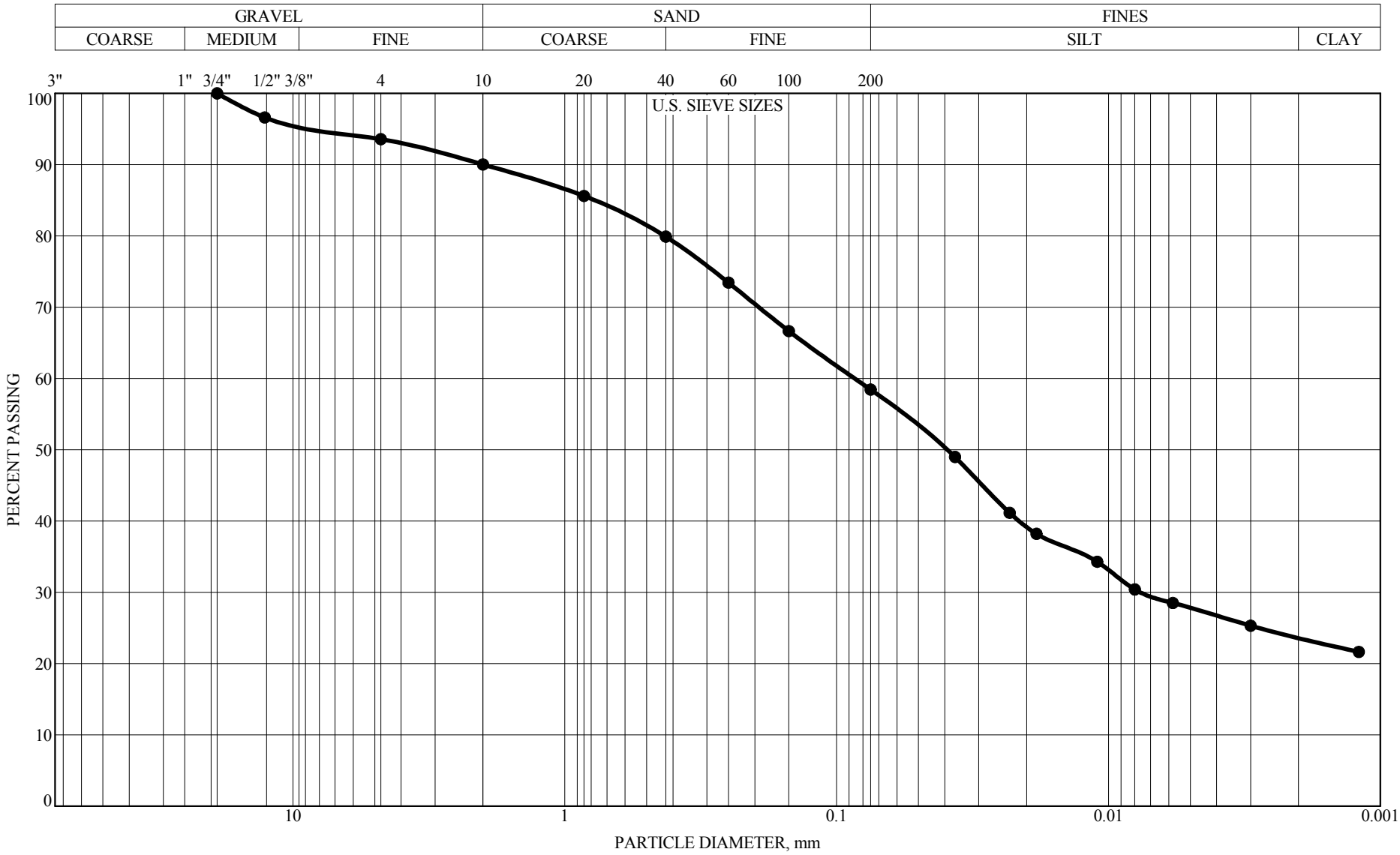
GRAVEL	5.1%
SAND	28.5%
SILT	39.0%
CLAY	27.4%

CLASSIFICATION:
A-6 (14), Brown
SANDY LEAN CLAY(CL)

LL=40, PL=15, PI=25; P200=66%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-018 DEPTH: 1.0'-10.0'

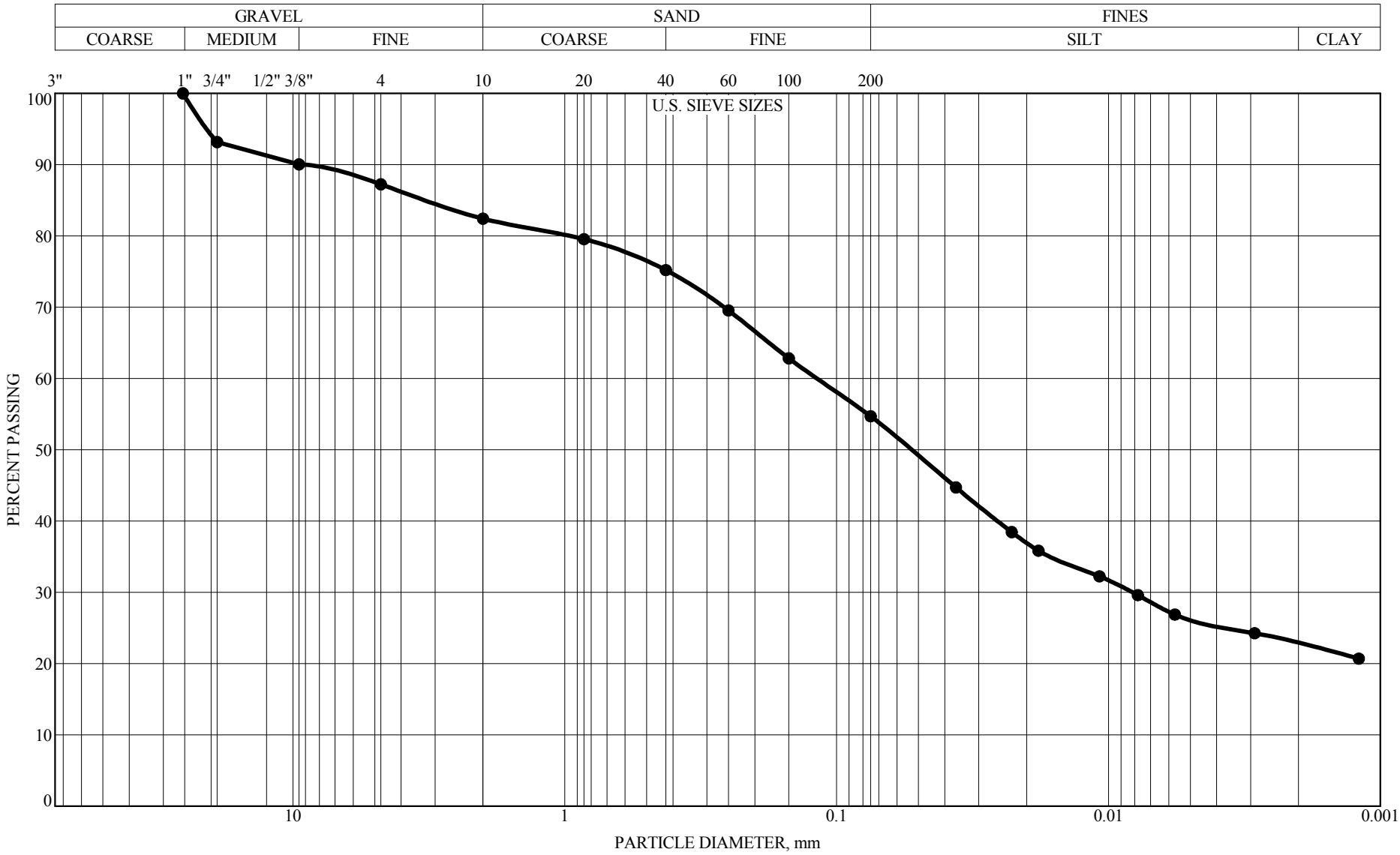
GRAVEL	10.0%
SAND	31.6%
SILT	34.8%
CLAY	23.7%

CLASSIFICATION:
A-6 (9), Brown
SANDY LEAN CLAY(CL)

LL=36, PL=14, PI=22; P200=58%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-019 DEPTH: 1.0'-10.0'

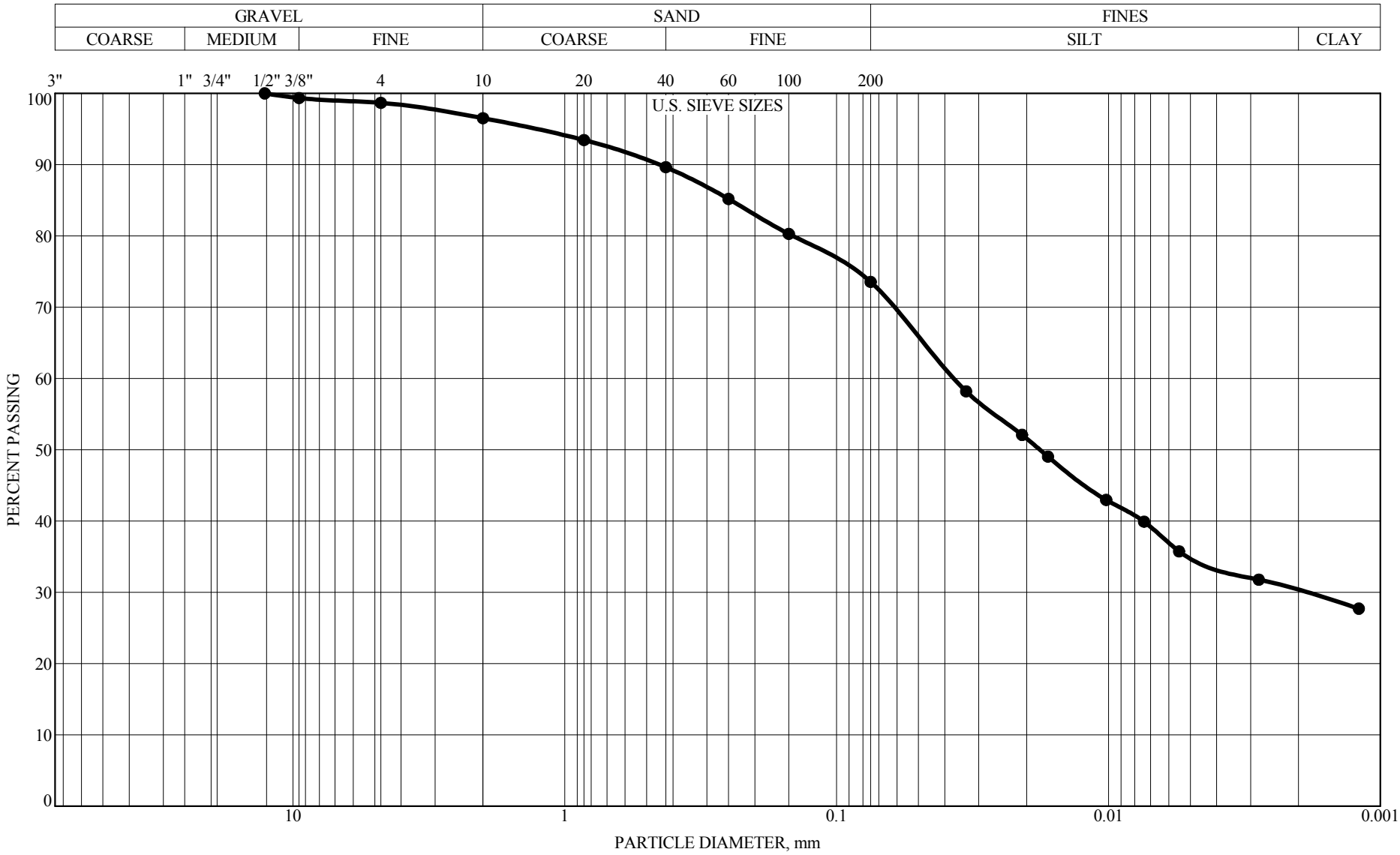
GRAVEL	17.6%
SAND	27.7%
SILT	31.9%
CLAY	22.8%

CLASSIFICATION:
A-6 (7), Brown
SANDY LEAN CLAY(CL)

LL=34, PL=14, PI=20; P200=55%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-020 DEPTH: 1.0'-6.0'

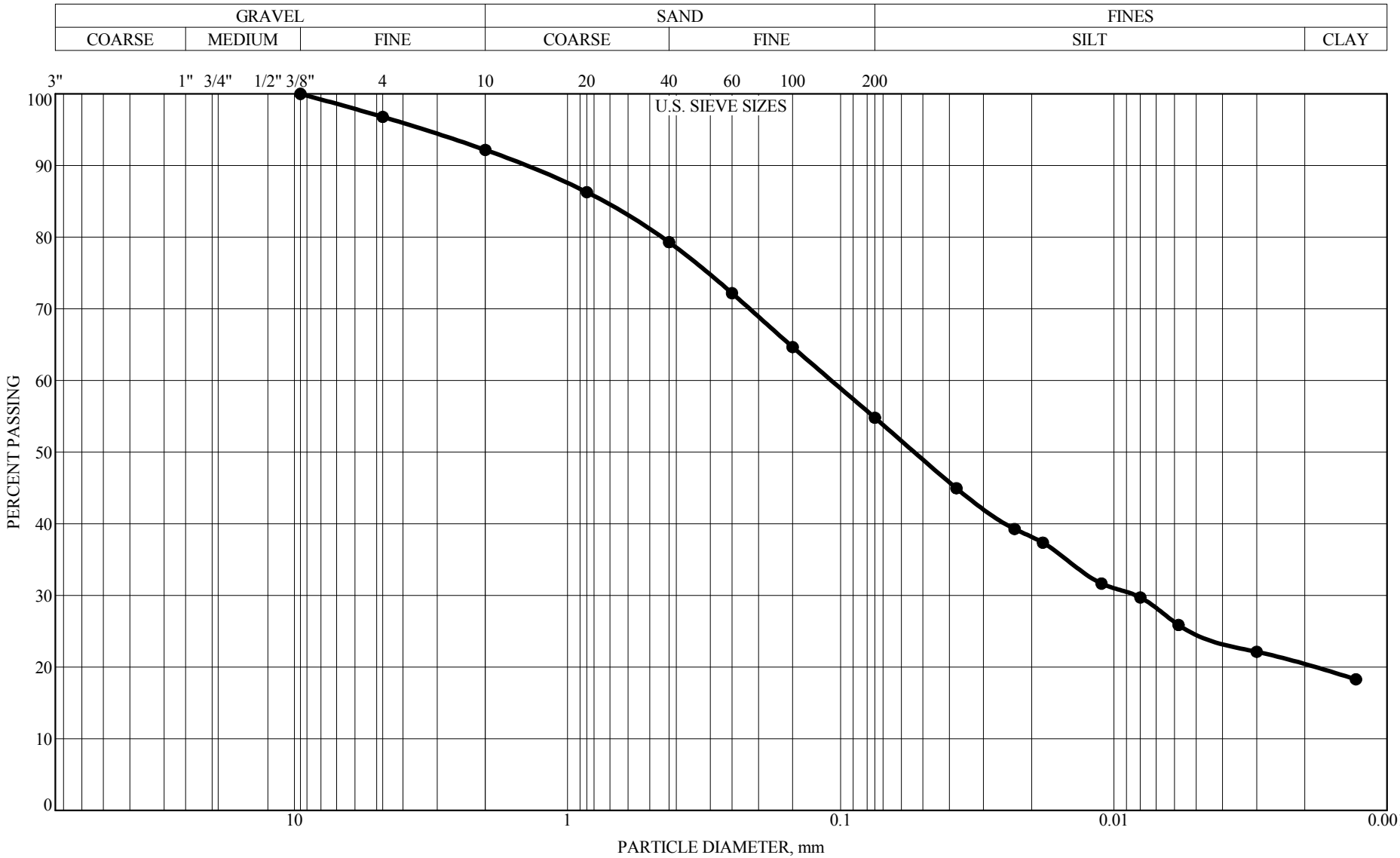
GRAVEL	3.5%
SAND	23.0%
SILT	43.4%
CLAY	30.2%

CLASSIFICATION:
A-6 (14), Brown
LEAN CLAY with SAND(CL)

LL=38, PL=16, PI=22; P200=74%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-021 DEPTH: 0.5'-6.0'

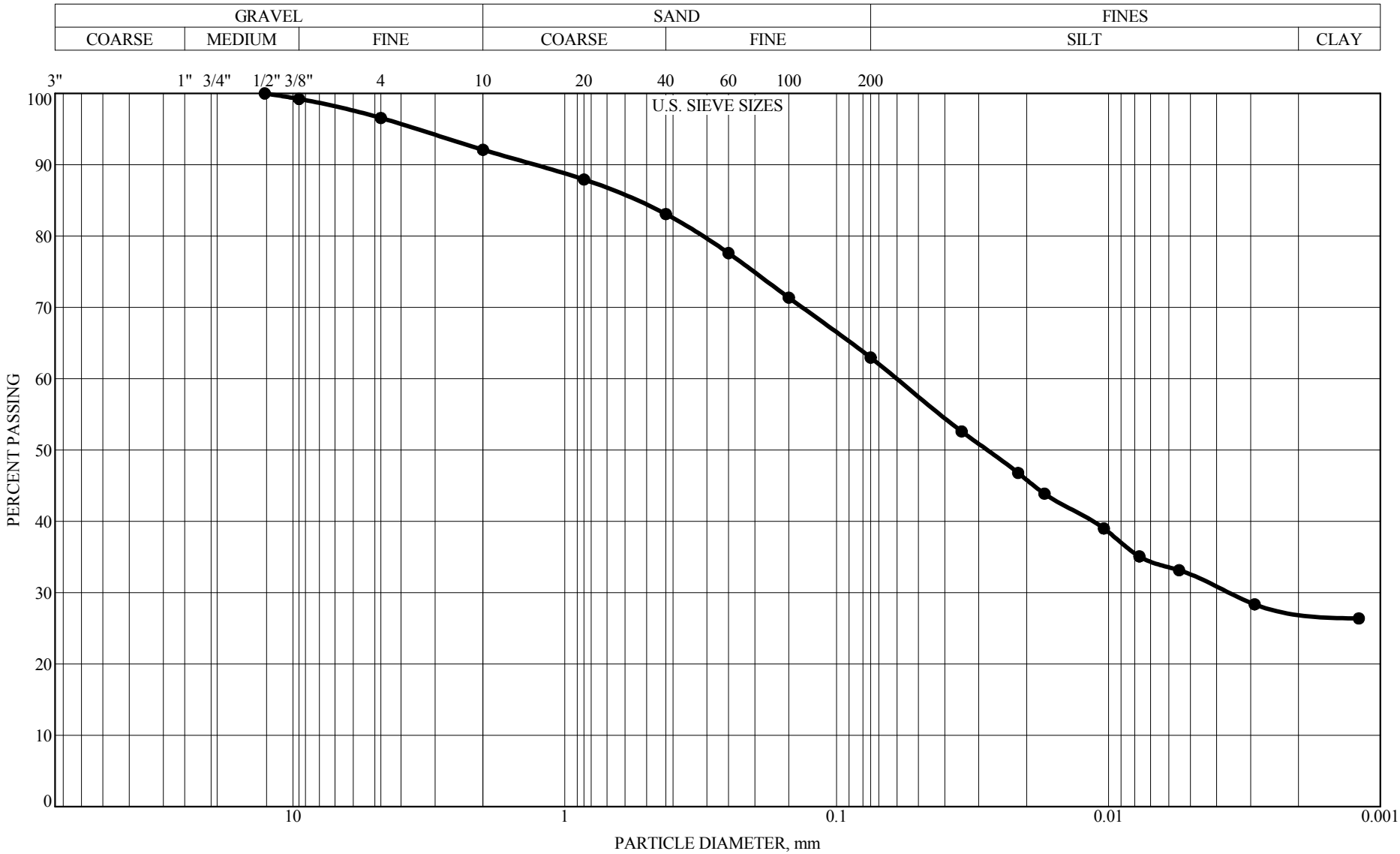
GRAVEL	7.8%
SAND	37.4%
SILT	34.5%
CLAY	20.3%

CLASSIFICATION:
A-6 (5), Brown
SANDY LEAN CLAY(CL)

LL=25, PL=10, PI=15; P200=55%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-022 DEPTH: 3.0'-15.0'

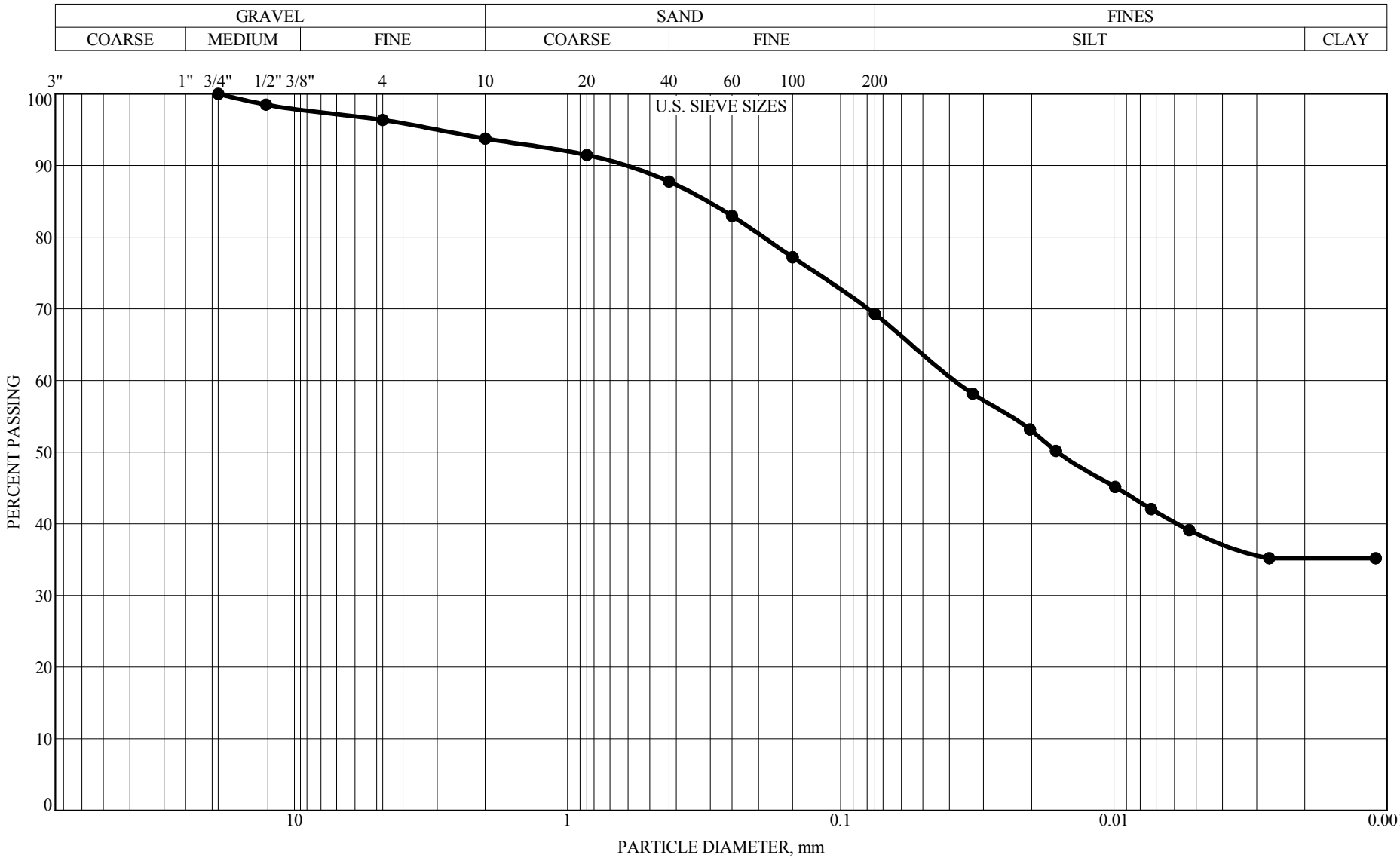
GRAVEL	7.9%
SAND	29.1%
SILT	35.4%
CLAY	27.5%

CLASSIFICATION:
A-6 (14), Brown
SANDY LEAN CLAY(CL)

LL=39, PL=12, PI=27; P200=63%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-023 DEPTH: 0.5'-15.0'

GRAVEL	6.2%
SAND	24.5%
SILT	34.1%
CLAY	35.2%

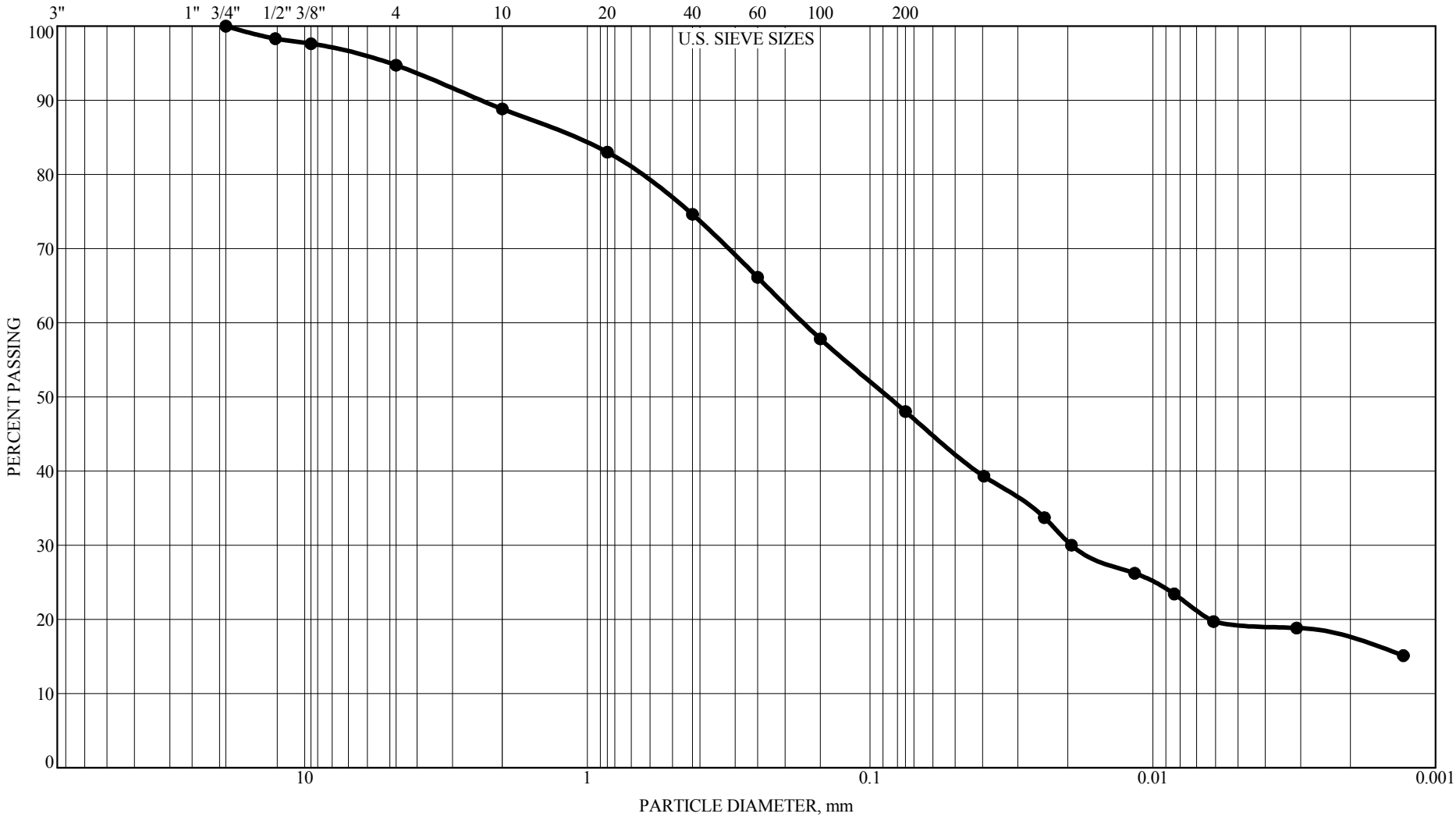
CLASSIFICATION:
A-7-6 (19), Brown
SANDY LEAN CLAY(CL)

LL=44, PL=13, PI=31; P200=69%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)

GRAVEL			SAND		FINES	
COARSE	MEDIUM	FINE	COARSE	FINE	SILT	CLAY



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-024 DEPTH: 2.0'-7.0'

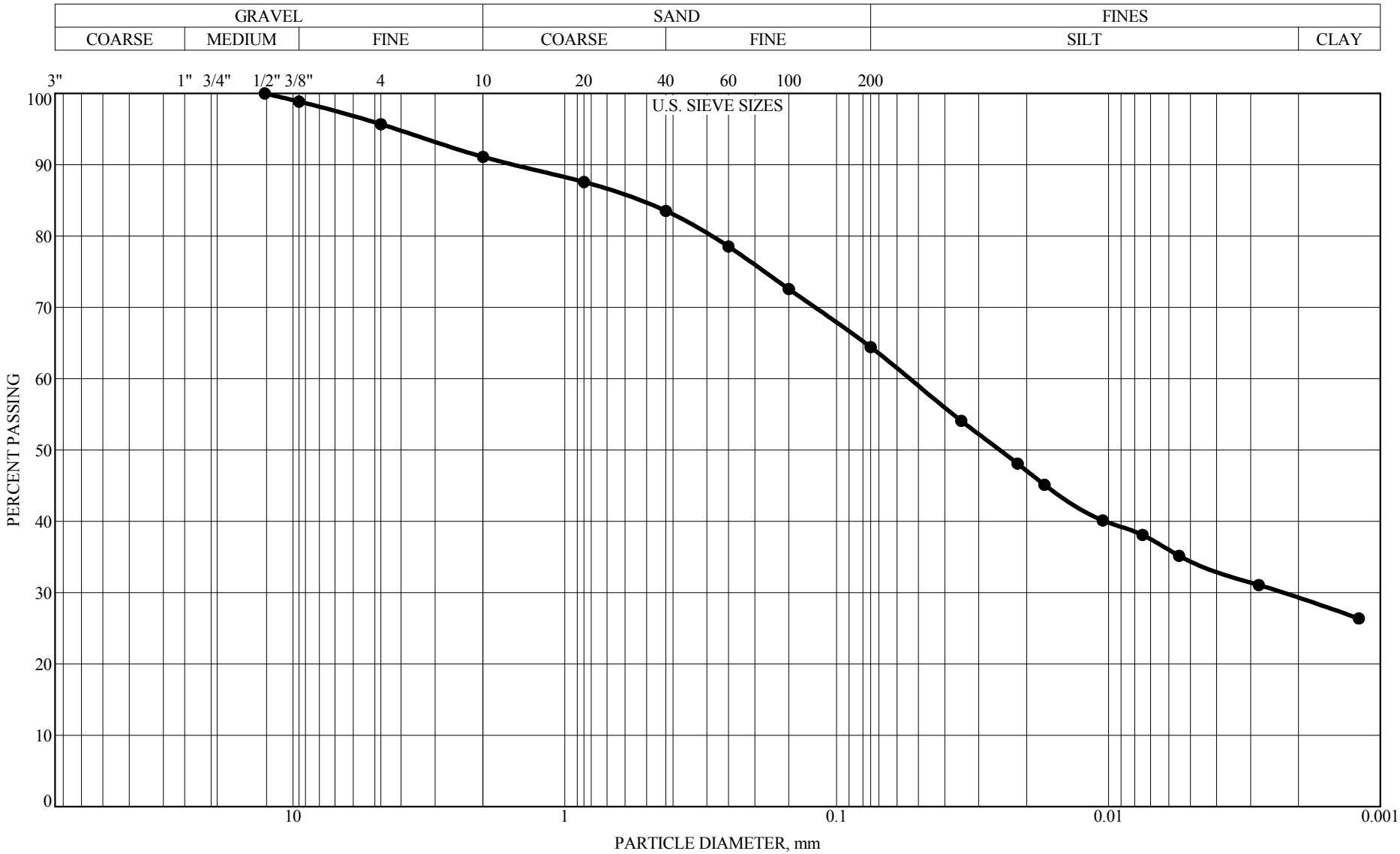
GRAVEL	11.2%
SAND	40.8%
SILT	31.1%
CLAY	17.0%

CLASSIFICATION:
A-6 (3), Brown
CLAYEY SAND(SC)

LL=26, PL=13, PI=13; P200=48%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-025 DEPTH: 0.5'-10.0'

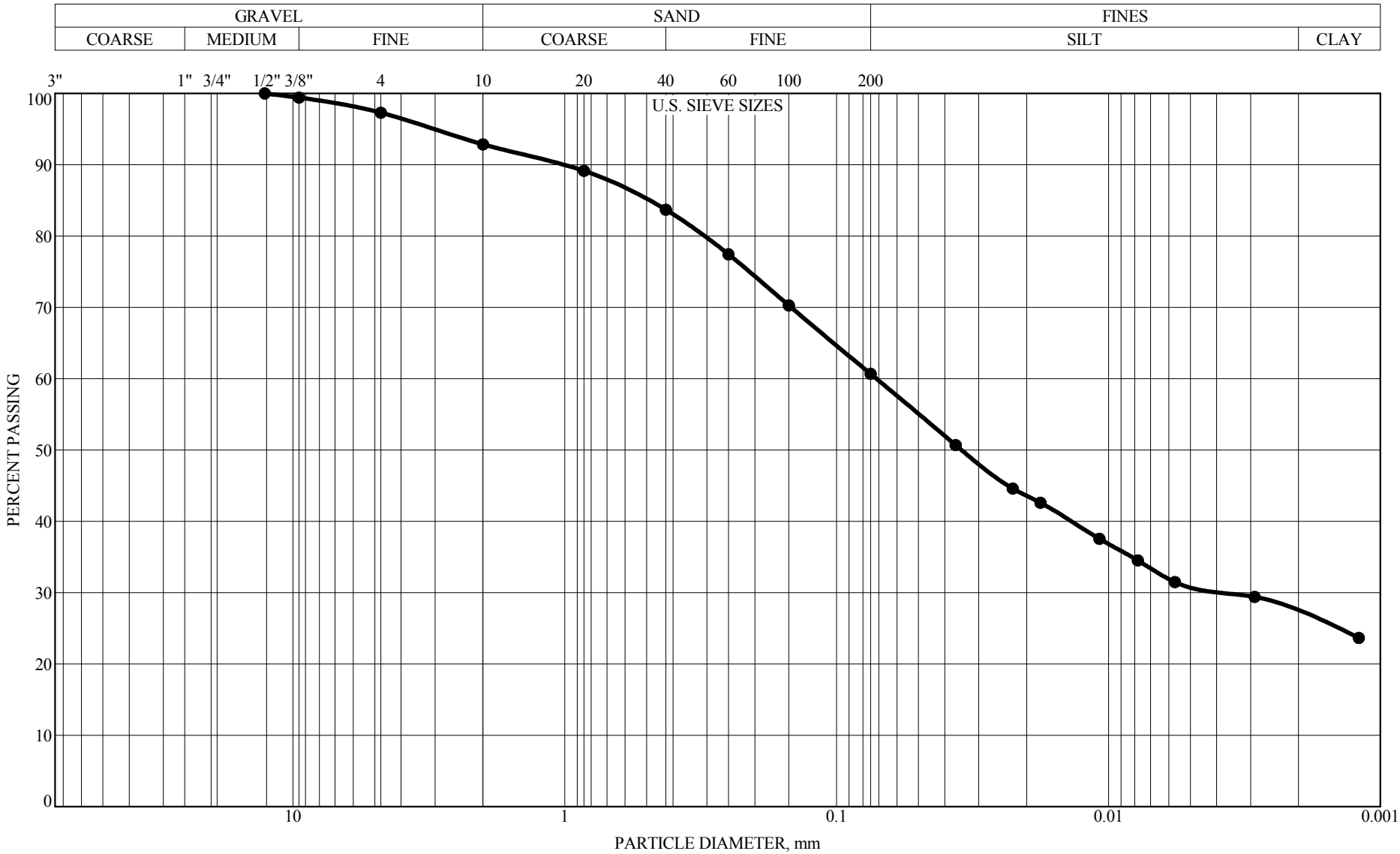
GRAVEL	8.9%
SAND	26.7%
SILT	35.2%
CLAY	29.2%

CLASSIFICATION:
A-6 (14), Brown
SANDY LEAN CLAY(CL)

LL=40, PL=13, PI=27; P200=64%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-026 DEPTH: 0.5'-10.0'

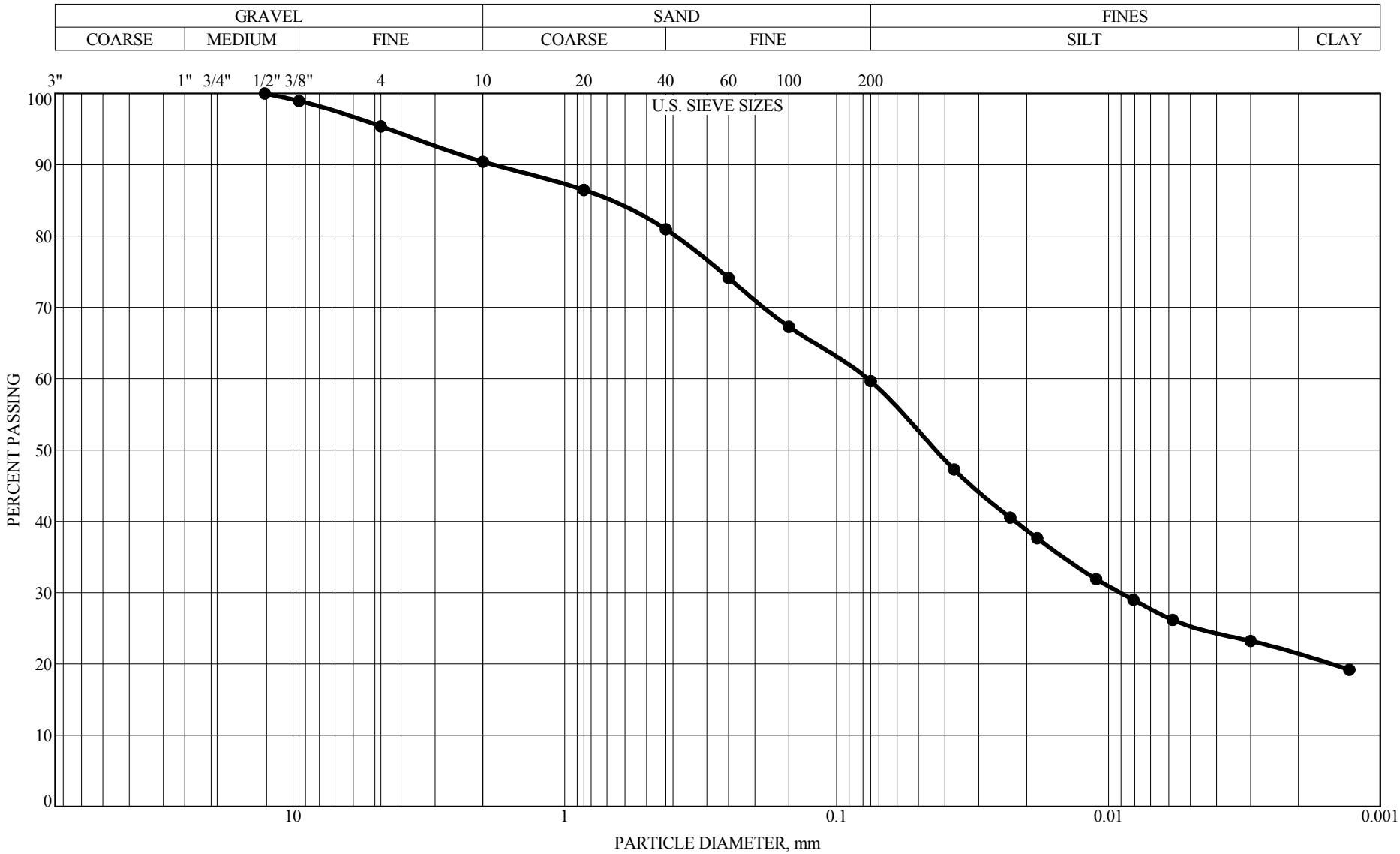
GRAVEL	7.1%
SAND	32.2%
SILT	33.7%
CLAY	27.0%

CLASSIFICATION:
A-6 (8), Brown
SANDY LEAN CLAY(CL)

LL=30, PL=11, PI=19; P200=61%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-027 DEPTH: 0.3'-5.0'

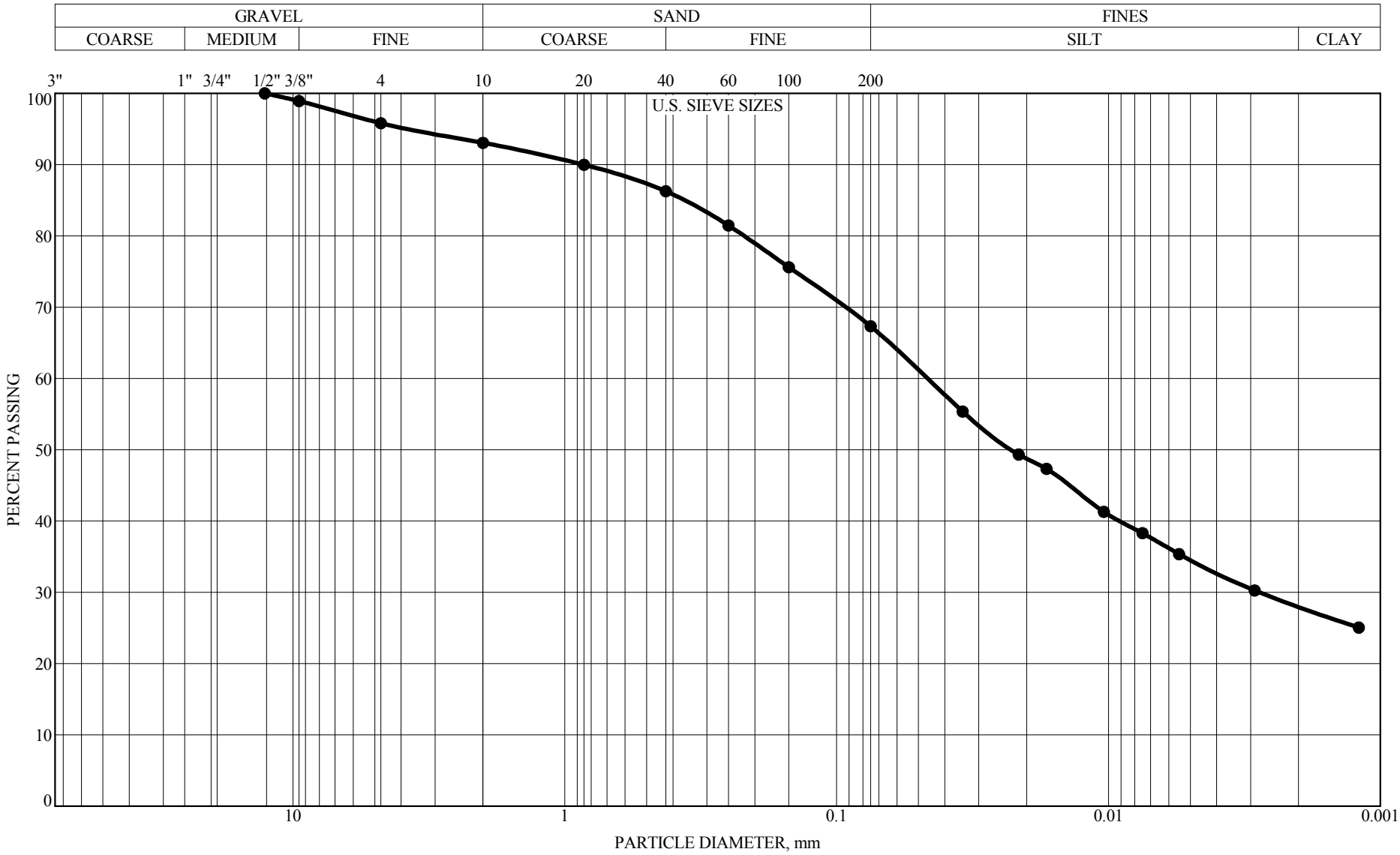
GRAVEL	9.6%
SAND	30.8%
SILT	38.4%
CLAY	21.3%

CLASSIFICATION:
A-6 (10), Dark Brown
SANDY LEAN CLAY(CL)

LL=37, PL=16, PI=21; P200=60%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-028 DEPTH: 0.3'-10.0'

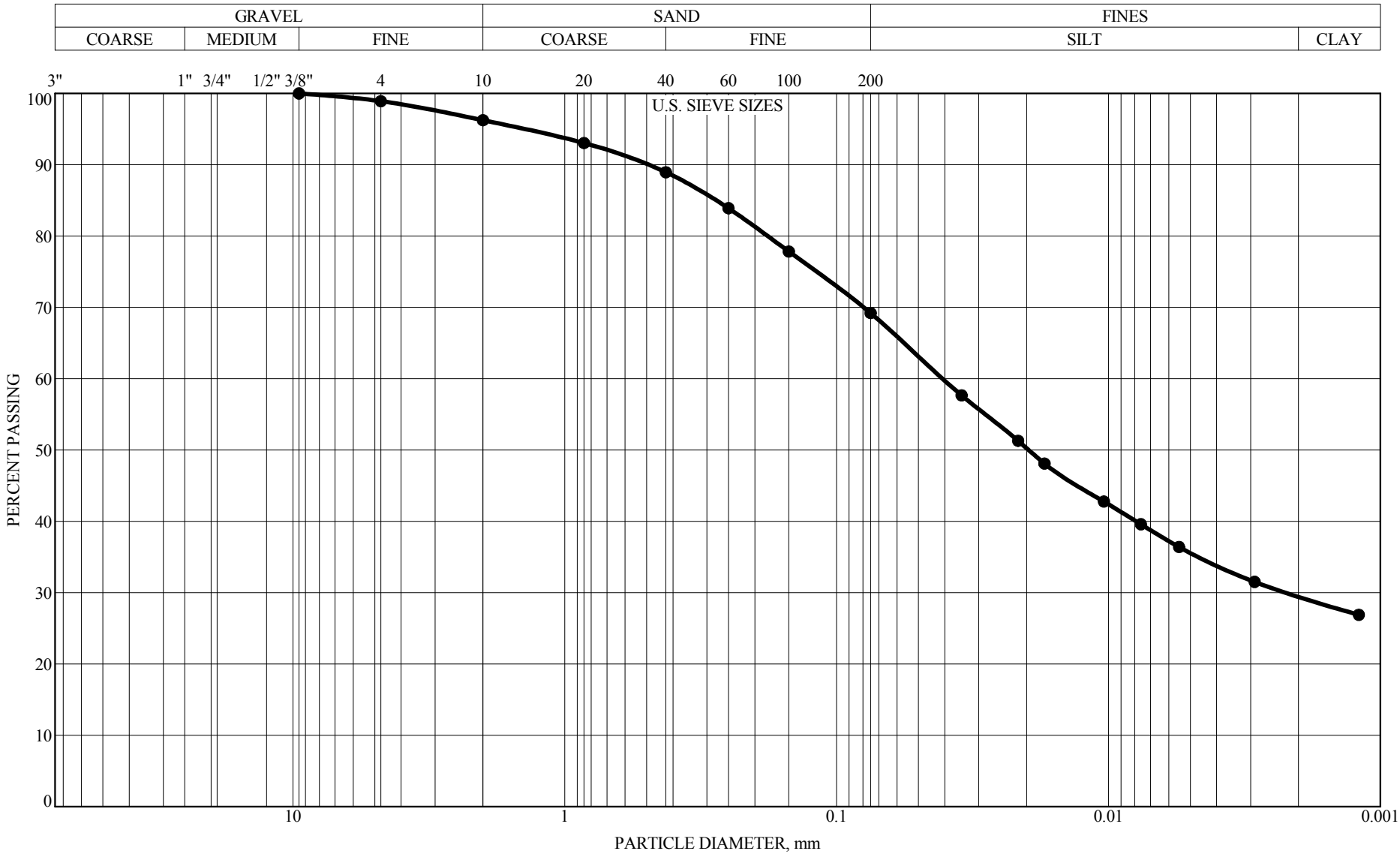
GRAVEL	6.9%
SAND	25.7%
SILT	39.3%
CLAY	28.1%

CLASSIFICATION:
A-7-6 (17), Brown
SANDY LEAN CLAY(CL)

LL=44, PL=14, PI=30; P200=67%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-029 DEPTH: 0.3'-15.0'

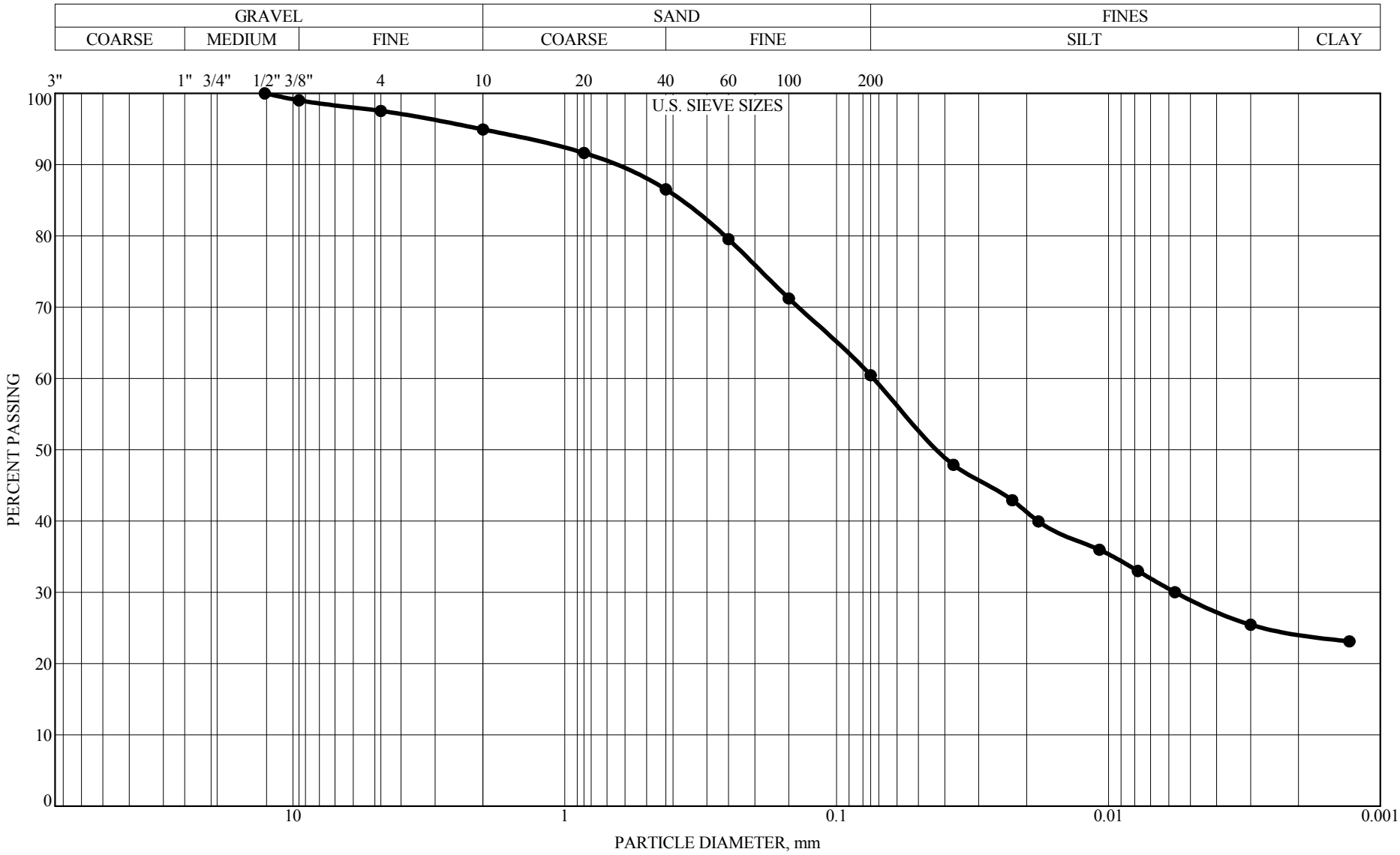
GRAVEL	3.8%
SAND	27.0%
SILT	39.6%
CLAY	29.6%

CLASSIFICATION:
A-7-6 (16), Brown
SANDY LEAN CLAY(CL)

LL=41, PL=14, PI=27; P200=69%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

GRAIN SIZE ACCUMULATION CURVE (AASHTO)



BRAUN INTERTEC

Braun Project FA-12-00359
Geotechnical Evaluation
Williston NW Bypass
Several Routes, NW of Williston
Williams County, North Dakota

BORING: LSS-030 DEPTH: 0.3'-5.0'

GRAVEL	5.1%
SAND	34.5%
SILT	36.1%
CLAY	24.3%

CLASSIFICATION:
A-6 (9), Brown
SANDY LEAN CLAY(CL)

LL=34, PL=13, PI=21; P200=60%

GS AASHTO 00359.GPJ BRAUN.GDT 4/17/13 10:08

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S1
Issue No: 1

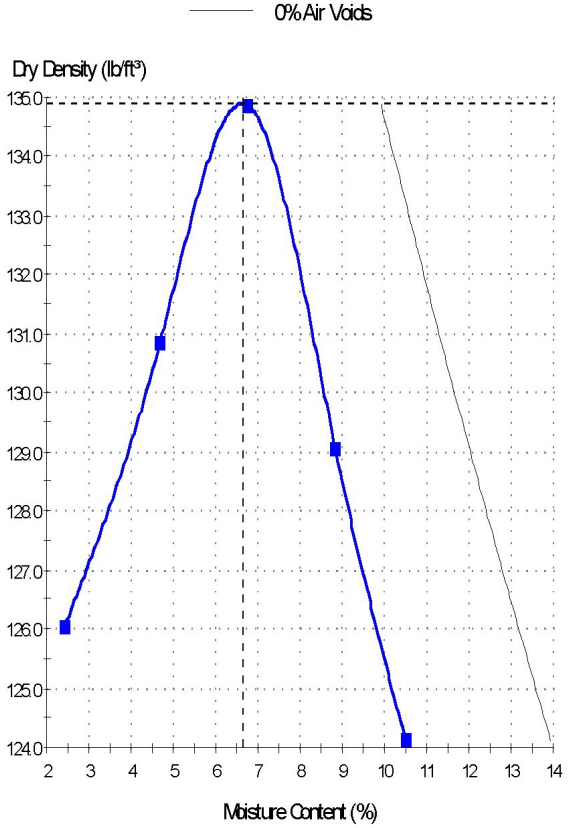
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/9/2013

Sample Details

Sample ID:	W13-000494-S1	**Alternate Sample ID:**	LSS-001; 2.1'-5'
Date Sampled:	3/25/2013	**Date Submitted:**	3/25/2013
Sampled By:	Steve Wenko	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Clayey Sand (SC); A-6 (3)		
Specification:	For Informational Purposes Only		
Location:	LSS-001; 2.1'-5'		
Tested By:	Josh Beringer	**Date Tested:**	4/2/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**135**
Corrected Maximum Dry Density (lb/ft³):	**135**
Optimum Moisture Content (%):	**7**
Corrected Optimum Moisture Content (%):	**7**
Method:	D
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 28; PI = 15
Percent Retained on #4 Sieve = 6.2%; Percent Passing #200 Sieve = 47.7%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S2
Issue No: 1

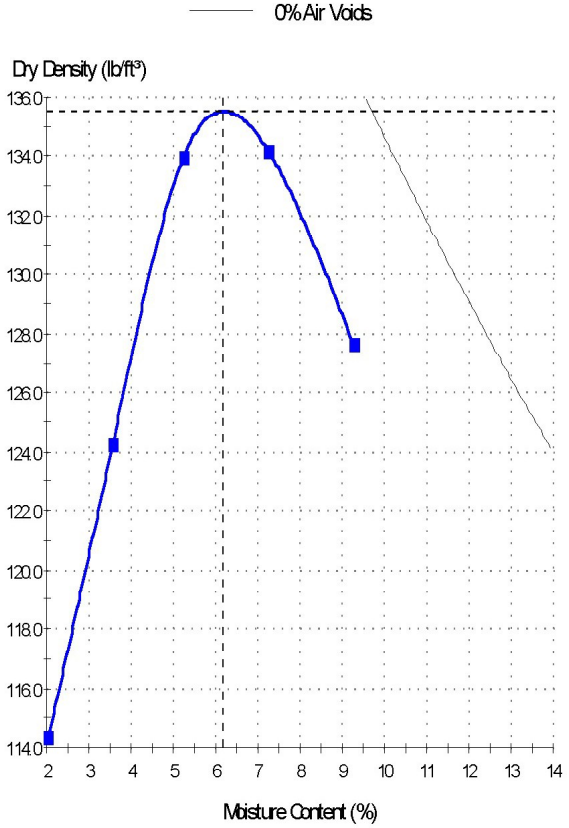
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/9/2013

Sample Details

Sample ID:	W13-000494-S2	**Alternate Sample ID:**	LSS-002; 2'-5'
Date Sampled:	3/25/2013	**Date Submitted:**	3/25/2013
Sampled By:	Steve Wenko	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Clayey Sand with Gravel (SC); A-2-6 (0)		
Specification:	For Informational Purposes Only		
Location:	LSS-002; 2'-5'		
Tested By:	Josh Beringer	**Date Tested:**	4/2/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**136**
Corrected Maximum Dry Density (lb/ft³):	**136**
Optimum Moisture Content (%):	**6**
Corrected Optimum Moisture Content (%):	**6**
Method:	D
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 24; PI = 11
Percent Retained on #4 Sieve = 29.7%; Percent Passing #200 Sieve = 21.4%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S3
Issue No: 1

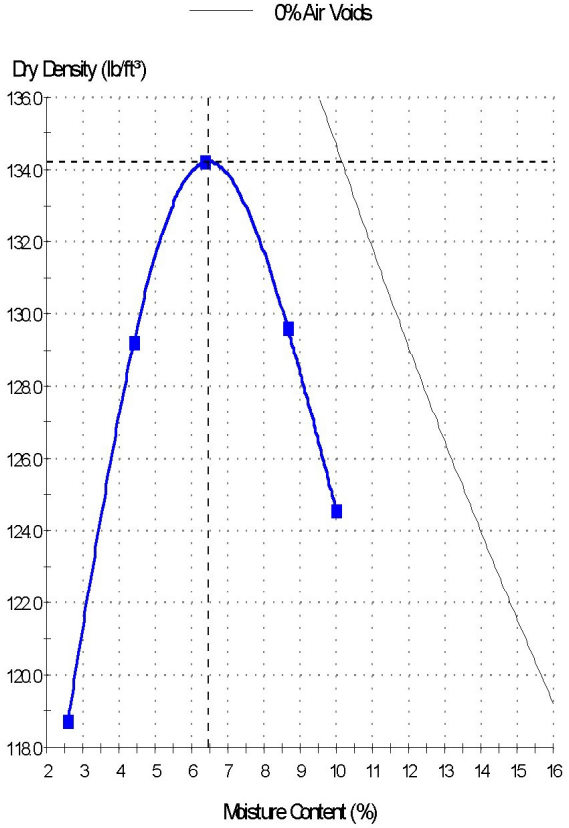
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/9/2013

Sample Details

Sample ID:	W13-000494-S3	**Alternate Sample ID:**	LSS-003; 2'-5'
Date Sampled:	3/25/2013	**Date Submitted:**	3/25/2013
Sampled By:	Steve Wenko	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Clayey Sand with Gravel (SC); A-2-4 (0)		
Specification:	For Informational Purposes Only		
Location:	LSS-003; 2'-5'		
Tested By:	Josh Beringer	**Date Tested:**	4/8/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**134**
Corrected Maximum Dry Density (lb/ft³):	**134**
Optimum Moisture Content (%):	**6**
Corrected Optimum Moisture Content (%):	**6**
Method:	D
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 23; PI = 9
Percent Retained on #4 Sieve = 30.7%; Percent Passing #200 Sieve = 17.3%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S4
Issue No: 1

Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102

Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801

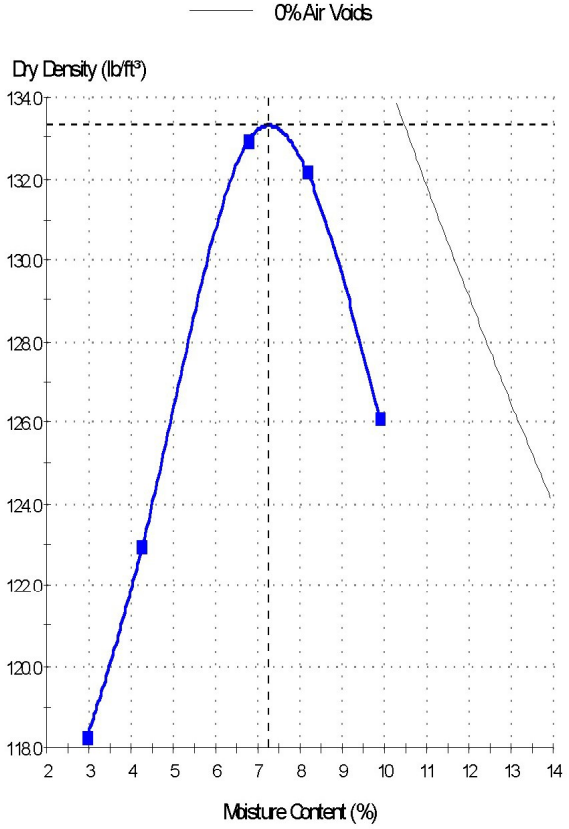
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/9/2013

Sample Details

Sample ID:	W13-000494-S4	**Alternate Sample ID:**	LSS-004; 2'-5'
Date Sampled:	3/25/2013	**Date Submitted:**	3/25/2013
Sampled By:	Steve Wenko	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Clayey Sand with Gravel (SC); A-2-6 (1)		
Specification:	For Informational Purposes Only		
Location:	LSS-004; 2'-5'		
Tested By:	Josh Beringer	**Date Tested:**	4/5/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**133**
Corrected Maximum Dry Density (lb/ft³):	**133**
Optimum Moisture Content (%):	**7**
Corrected Optimum Moisture Content (%):	**7**
Method:	D
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 28; PI = 15
Percent Retained on #4 Sieve = 19.2%; Percent Pasing #200 Sieve = 34.4%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S5
Issue No: 1

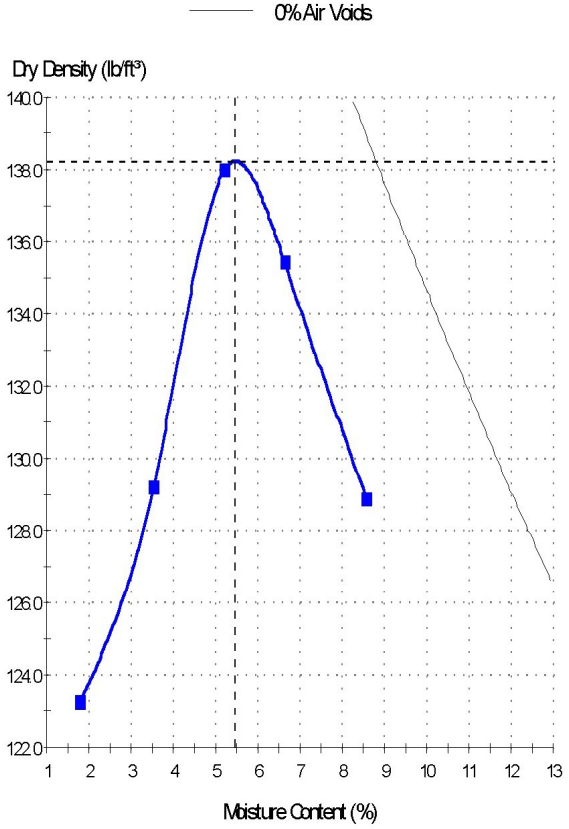
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/9/2013

Sample Details

Sample ID:	W13-000494-S5	**Alternate Sample ID:**	LSS-005; 2.5'-5'
Date Sampled:	3/25/2013	**Date Submitted:**	3/25/2013
Sampled By:	Steve Wenko	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Silty Sand with Gravel (SM); A-1-b (0)		
Specification:	For Informational Purposes Only		
Location:	LSS-005; 2.5'-5'		
Tested By:	Josh Beringer	**Date Tested:**	4/1/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**138**
Corrected Maximum Dry Density (lb/ft³):	**138**
Optimum Moisture Content (%):	**5**
Corrected Optimum Moisture Content (%):	**5**
Method:	D
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
Non-Plastic
Percent Retained on #4 Sieve = 30.2%; Percent Passing #200 Sieve = 17.7%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S6
Issue No: 1

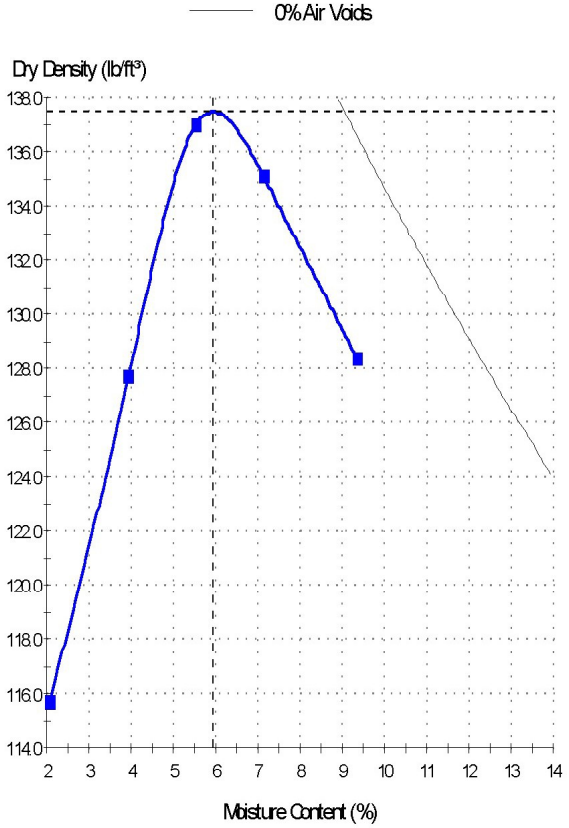
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/9/2013

Sample Details

Sample ID:	W13-000494-S6	**Alternate Sample ID:**	LSS-006; 2.2'-5'
Date Sampled:	3/25/2013	**Date Submitted:**	3/25/2013
Sampled By:	Steve Wenko	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Clayey Sand with Gravel (SC); A-2-4 (0)		
Specification:	For Informational Purposes Only		
Location:	LSS-006; 2.2'-5'		
Tested By:	Josh Beringer	**Date Tested:**	4/2/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**137**
Corrected Maximum Dry Density (lb/ft³):	**137**
Optimum Moisture Content (%):	**6**
Corrected Optimum Moisture Content (%):	**6**
Method:	D
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 22; PI = 8
Percent Retained on #4 Sieve = 37.8%; Percent Passing #200 Sieve = 15.3%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S8
Issue No: 1

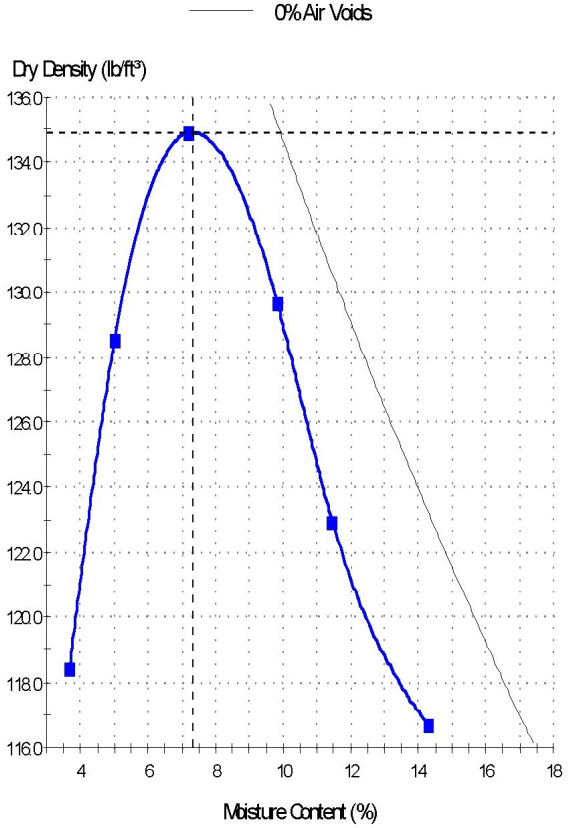
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/5/2013

Sample Details

Sample ID:	W13-000494-S8	**Alternate Sample ID:**	LSS-008; 1'-10'
Date Sampled:	3/12/2013	**Date Submitted:**	3/14/2013
Sampled By:	John Brooks	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-6 (7)		
Specification:	For Informational Purposes Only		
Location:	LSS-008; 1'-10'		
Tested By:	Thomas Wagner	**Date Tested:**	3/19/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**135**
Corrected Maximum Dry Density (lb/ft³):	**135**
Optimum Moisture Content (%):	**7**
Corrected Optimum Moisture Content (%):	**7**
Method:	D
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 31; PI = 18
Percent Retained on #4 Sieve = 7.2%; Percent Passing #200 Sieve = 57.0%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S10
Issue No: 1

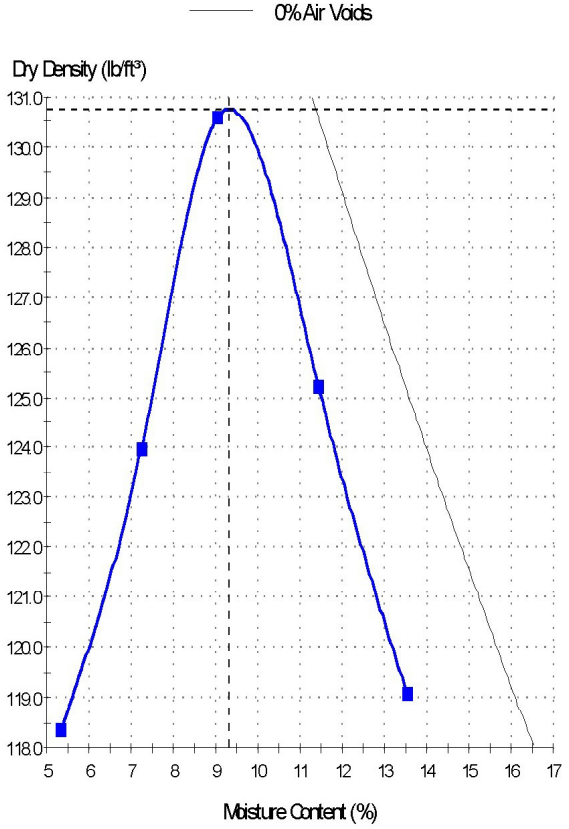
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/5/2013

Sample Details

Sample ID:	W13-000494-S10	**Alternate Sample ID:**	LSS-010; 3'-10'
Date Sampled:	3/12/2013	**Date Submitted:**	3/14/2013
Sampled By:	John Brooks	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-6 (5)		
Specification:	For Informational Purposes Only		
Location:	LSS-010; 3'-10'		
Tested By:	Kevin Ficek	**Date Tested:**	3/19/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**131**
Corrected Maximum Dry Density (lb/ft³):	**131**
Optimum Moisture Content (%):	**9**
Corrected Optimum Moisture Content (%):	**9**
Method:	D
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 29; PI = 15
Percent Retained on #4 Sieve = 5.4%; Percent Passing #200 Sieve = 55.6%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S11
Issue No: 1

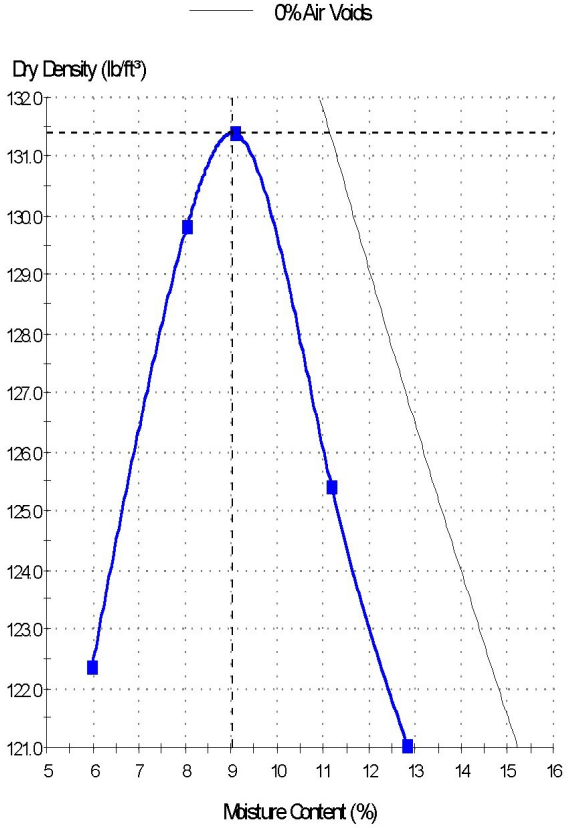
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/5/2013

Sample Details

Sample ID:	W13-000494-S11	**Alternate Sample ID:**	LSS-011; 0'-6'
Date Sampled:	3/12/2013	**Date Submitted:**	3/14/2013
Sampled By:	John Brooks	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-6 (10)		
Specification:	For Informational Purposes Only		
Location:	LSS-011; 0'-6'		
Tested By:	Kevin Ficek	**Date Tested:**	3/19/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**131**
Corrected Maximum Dry Density (lb/ft³):	**131**
Optimum Moisture Content (%):	**9**
Corrected Optimum Moisture Content (%):	**9**
Method:	D
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 34; PI = 19
Percent Retained on #4 Sieve = 5.7%; Percent Passing #200 Sieve = 64.6%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S12
Issue No: 1

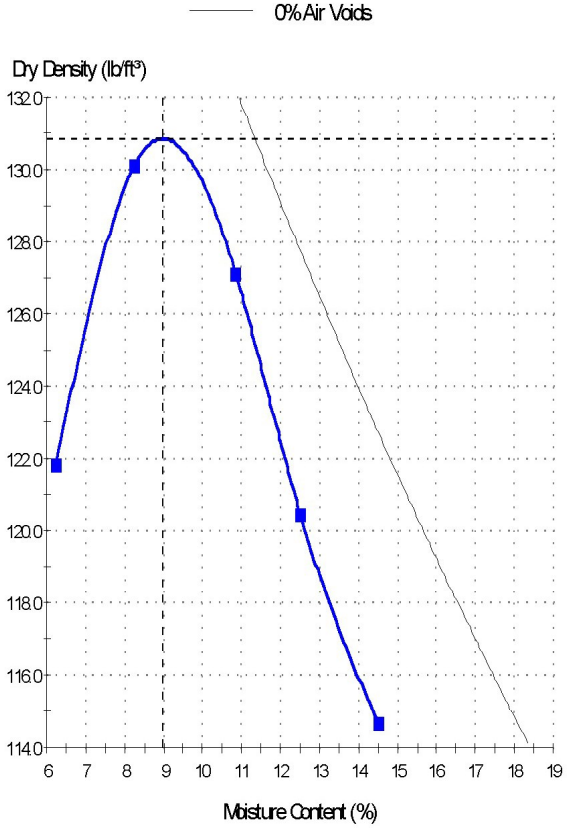
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/5/2013

Sample Details

Sample ID:	W13-000494-S12	**Alternate Sample ID:**	LSS-012; 0'-10'
Date Sampled:	3/12/2013	**Date Submitted:**	3/14/2013
Sampled By:	John Brooks	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-6 (6)		
Specification:	For Informational Purposes Only		
Location:	LSS-012; 0'-10'		
Tested By:	Thomas Wagner	**Date Tested:**	3/20/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**131**
Corrected Maximum Dry Density (lb/ft³):	**131**
Optimum Moisture Content (%):	**9**
Corrected Optimum Moisture Content (%):	**9**
Method:	D
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 31; PI = 17
Percent Retained on #4 Sieve = 5.3%; Percent Passing #200 Sieve = 57.4%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S13
Issue No: 1

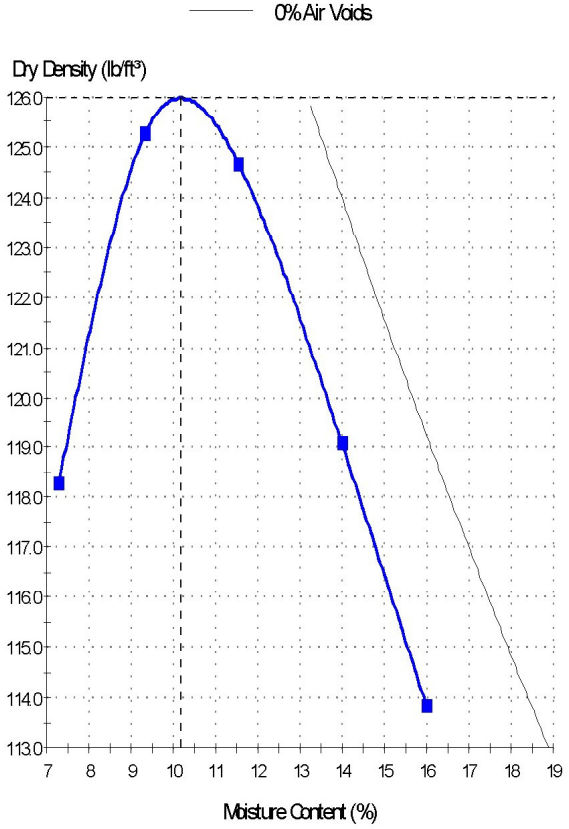
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/5/2013

Sample Details

Sample ID:	W13-000494-S13	**Alternate Sample ID:**	LSS-013; 1'-10
Date Sampled:	3/12/2013	**Date Submitted:**	3/14/2013
Sampled By:	John Brooks	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-7-6 (16)		
Specification:	For Informational Purposes Only		
Location:	LSS-013; 1'-10		
Tested By:	Matt Daavetilla	**Date Tested:**	3/20/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**126**
Corrected Maximum Dry Density (lb/ft³):	**126**
Optimum Moisture Content (%):	**10**
Corrected Optimum Moisture Content (%):	**10**
Method:	A
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 42; PI = 28
Percent Retained on #4 Sieve = 2.8%; Percent Passing #200 Sieve = 67.1%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S14
Issue No: 1

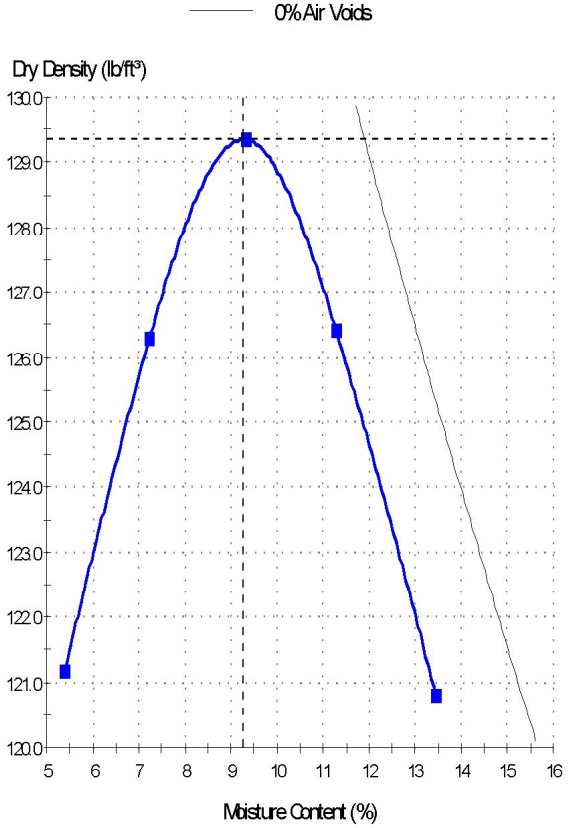
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/5/2013

Sample Details

Sample ID:	W13-000494-S14	**Alternate Sample ID:**	LSS-14; 1'-10
Date Sampled:	3/12/2013	**Date Submitted:**	3/14/2013
Sampled By:	John Brooks	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-6 (12)		
Specification:	For Informational Purposes Only		
Location:	LSS-14; 1'-10		
Tested By:	Rodney Schnieder	**Date Tested:**	3/20/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**129**
Corrected Maximum Dry Density (lb/ft³):	**129**
Optimum Moisture Content (%):	**9**
Corrected Optimum Moisture Content (%):	**9**
Method:	A
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 37; PI = 24
Percent Retained on #4 Sieve = 4.1%; Percent Passing #200 Sieve = 63.3%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S15
Issue No: 1

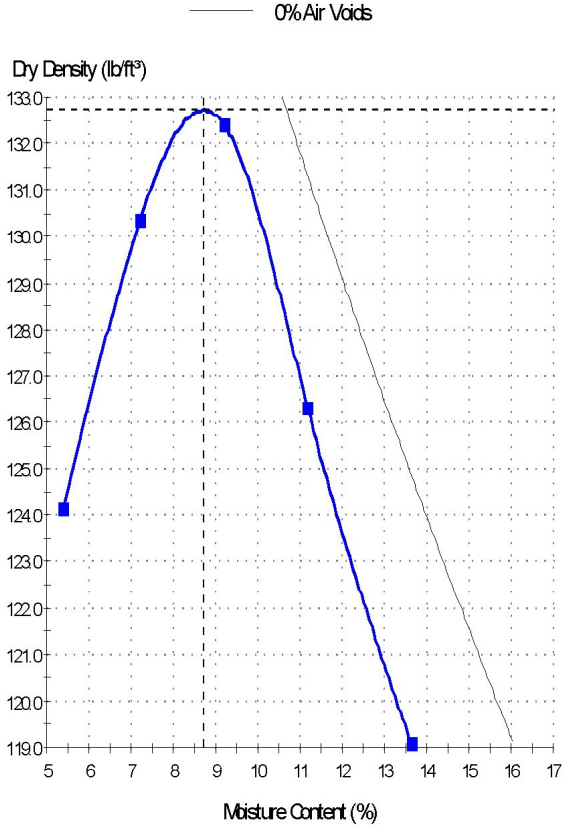
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/5/2013

Sample Details

Sample ID:	W13-000494-S15	**Alternate Sample ID:**	LSS-15; 2'-10'
Date Sampled:	3/12/2013	**Date Submitted:**	3/14/2013
Sampled By:	John Brooks	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-6 (9)		
Specification:	For Informational Purposes Only		
Location:	LSS-15; 2'-10'		
Tested By:	Shane Falwey	**Date Tested:**	3/20/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**133**
Corrected Maximum Dry Density (lb/ft³):	**133**
Optimum Moisture Content (%):	**9**
Corrected Optimum Moisture Content (%):	**9**
Method:	A
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 32; PI = 20
Percent Retained on #4 Sieve = 3.9%; Percent Passing #200 Sieve = 63.4%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S16
Issue No: 1

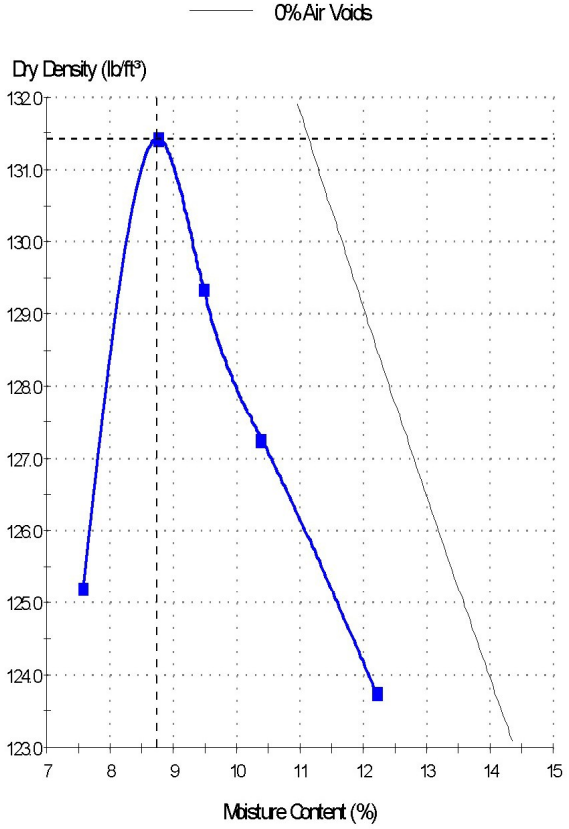
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/5/2013

Sample Details

Sample ID:	W13-000494-S16	**Alternate Sample ID:**	LSS-16; 3'-10'
Date Sampled:	3/12/2013	**Date Submitted:**	3/15/2013
Sampled By:	John Brooks	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-6 (12)		
Specification:	For Informational Purposes Only		
Location:	LSS-16; 3'-10'		
Tested By:	Kevin Ficek	**Date Tested:**	3/19/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**131**
Corrected Maximum Dry Density (lb/ft³):	**131**
Optimum Moisture Content (%):	**9**
Corrected Optimum Moisture Content (%):	**9**
Method:	D
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 39; PI = 25
Percent Retained on #4 Sieve = 7.0%; Percent Passing #200 Sieve = 60.7%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S17
Issue No: 1

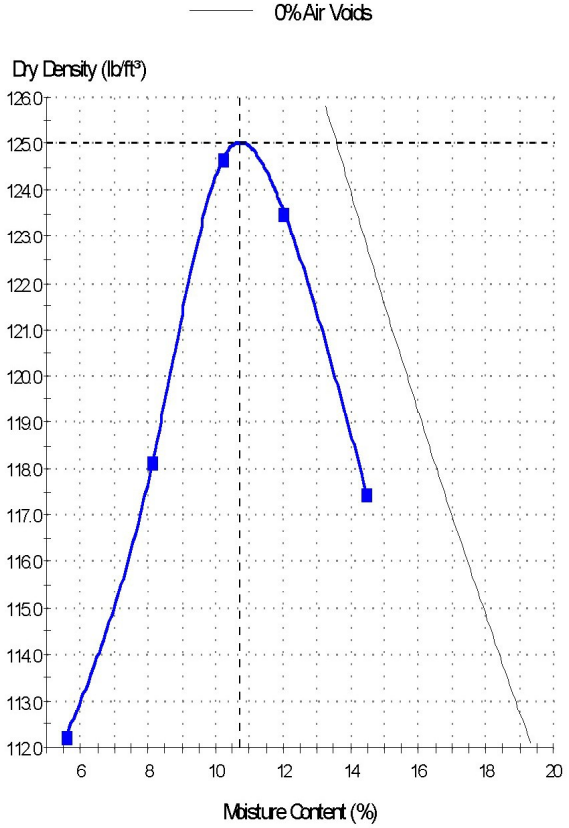
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/5/2013

Sample Details

Sample ID:	W13-000494-S17	**Alternate Sample ID:**	LSS-17; 1'-6'
Date Sampled:	3/12/2013	**Date Submitted:**	3/14/2013
Sampled By:	John Brooks	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-6 (14)		
Specification:	For Informational Purposes Only		
Location:	LSS-17; 1'-6'		
Tested By:	Kevin Ficek	**Date Tested:**	3/20/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**125**
Corrected Maximum Dry Density (lb/ft³):	**125**
Optimum Moisture Content (%):	**11**
Corrected Optimum Moisture Content (%):	**11**
Method:	A
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 40; PI = 25
Percent Retained on #4 Sieve = 3.2%; Percent Passing #200 Sieve = 66.4%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S18
Issue No: 1

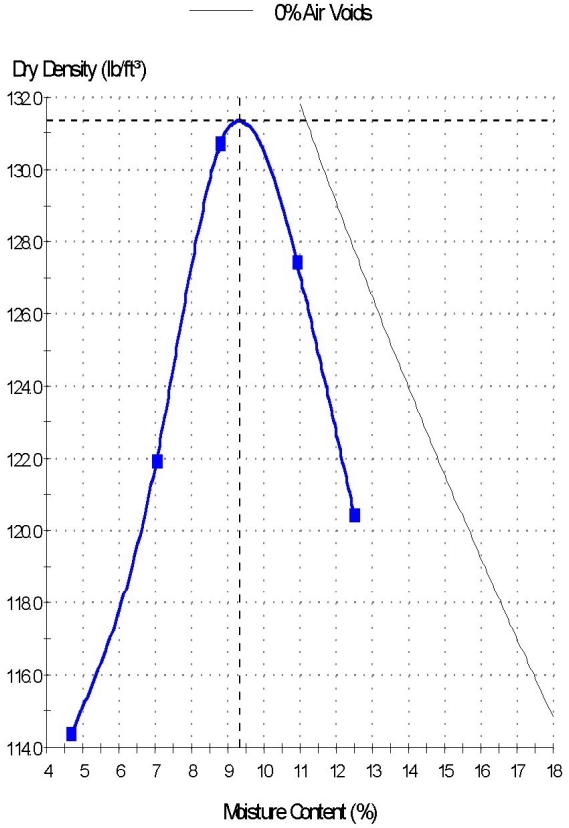
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/5/2013

Sample Details

Sample ID:	W13-000494-S18	**Alternate Sample ID:**	LSS-18; 1'-10'
Date Sampled:	3/12/2013	**Date Submitted:**	3/14/2013
Sampled By:	John Brooks	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-6 (9)		
Specification:	For Informational Purposes Only		
Location:	LSS-18; 1'-10'		
Tested By:	Thomas Wagner	**Date Tested:**	3/21/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**131**
Corrected Maximum Dry Density (lb/ft³):	**131**
Optimum Moisture Content (%):	**9**
Corrected Optimum Moisture Content (%):	**9**
Method:	D
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 36; PI = 22
Percent Retained on #4 Sieve = 6.4%; Percent Passing #200 Sieve = 58.4%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S19
Issue No: 1

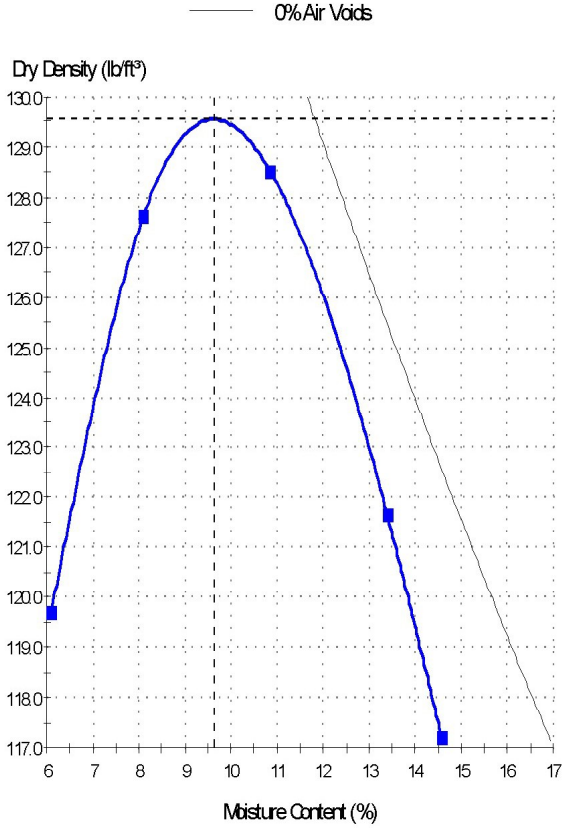
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/5/2013

Sample Details

Sample ID:	W13-000494-S19	**Alternate Sample ID:**	LSS-019; 1'-10'
Date Sampled:	3/12/2013	**Date Submitted:**	3/14/2013
Sampled By:	John Brooks	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-6 (7)		
Specification:	For Informational Purposes Only		
Location:	LSS-019; 1'-10'		
Tested By:	Kevin Ficek	**Date Tested:**	3/21/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**130**
Corrected Maximum Dry Density (lb/ft³):	**130**
Optimum Moisture Content (%):	**10**
Corrected Optimum Moisture Content (%):	**10**
Method:	D
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 34; PI = 20
Percent Retained on #4 Sieve = 12.8%; Percent Passing #200 Sieve = 54.7%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S20
Issue No: 1

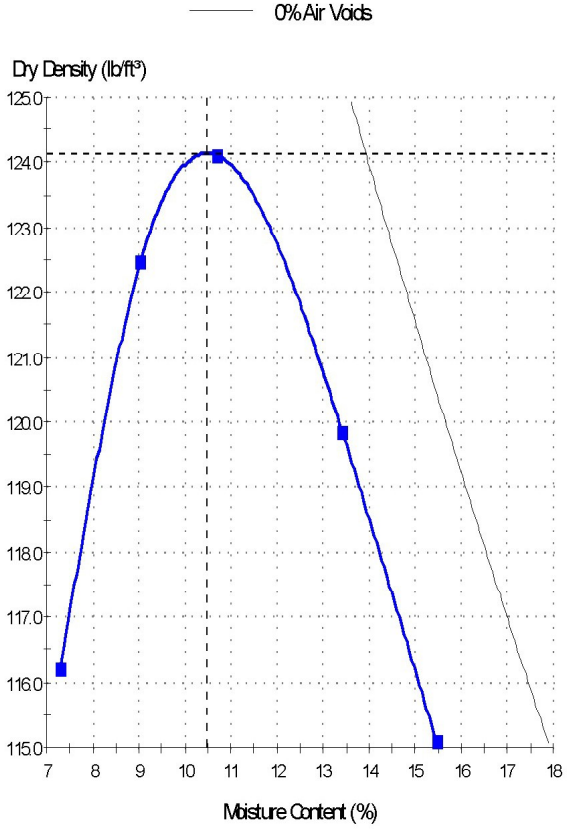
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/5/2013

Sample Details

Sample ID:	W13-000494-S20	**Alternate Sample ID:**	LSS-20; 1'-6'
Date Sampled:	3/12/2013	**Date Submitted:**	3/14/2013
Sampled By:	John Brooks	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Lean Clay with Sand (CL); A-6 (14)		
Specification:	For Informational Purposes Only		
Location:	LSS-20; 1'-6'		
Tested By:	Shane Falwey	**Date Tested:**	3/22/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**124**
Corrected Maximum Dry Density (lb/ft³):	**124**
Optimum Moisture Content (%):	**10**
Corrected Optimum Moisture Content (%):	**10**
Method:	A
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 38; PI = 22
Percent Retained on #4 Sieve = 1.3%; Percent Passing #200 Sieve = 73.6%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S21
Issue No: 1

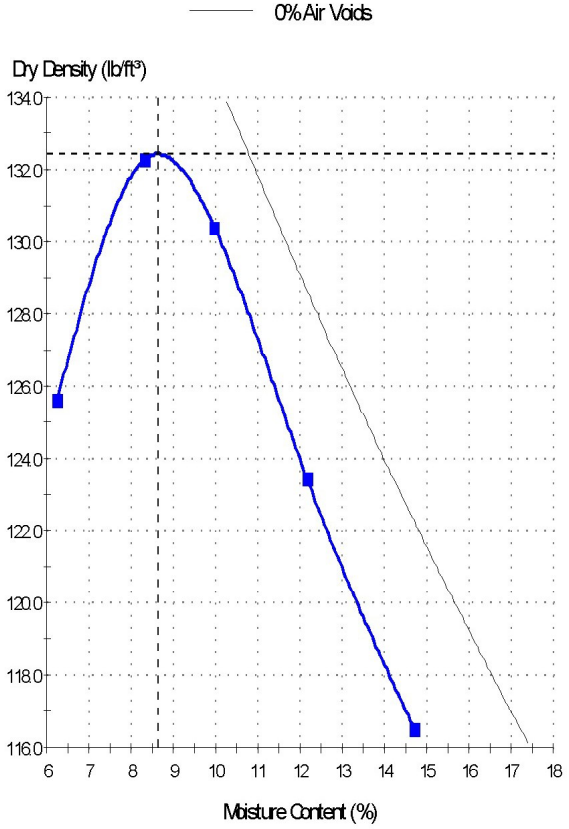
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/5/2013

Sample Details

Sample ID:	W13-000494-S21	**Alternate Sample ID:**	LSS-21; 0.5'-6'
Date Sampled:	3/12/2013	**Date Submitted:**	3/14/2013
Sampled By:	John Brooks	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-6 (5)		
Specification:	For Informational Purposes Only		
Location:	LSS-21; 0.5'-6'		
Tested By:	Thomas Wagner	**Date Tested:**	3/21/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**132**
Corrected Maximum Dry Density (lb/ft³):	**132**
Optimum Moisture Content (%):	**9**
Corrected Optimum Moisture Content (%):	**9**
Method:	A
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 25; PI = 15
Percent Retained on #4 Sieve = 3.2%; Percent Passing #200 Sieve = 54.8%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S22
Issue No: 1

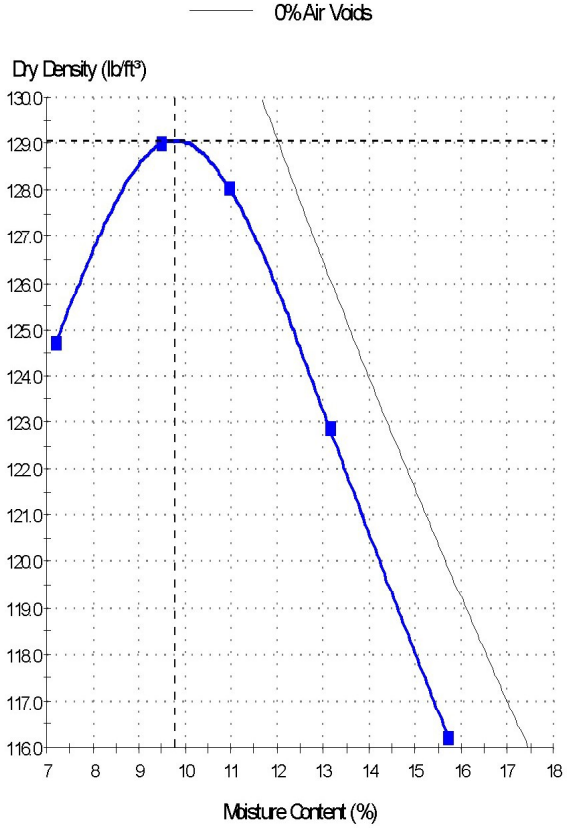
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/5/2013

Sample Details

Sample ID:	W13-000494-S22	**Alternate Sample ID:**	LSS-22; 3'-15'
Date Sampled:	3/12/2013	**Date Submitted:**	3/14/2013
Sampled By:	John Brooks	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-6 (14)		
Specification:	For Informational Purposes Only		
Location:	LSS-22; 3'-15'		
Tested By:	Thomas Wagner	**Date Tested:**	3/21/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**129**
Corrected Maximum Dry Density (lb/ft³):	**129**
Optimum Moisture Content (%):	**10**
Corrected Optimum Moisture Content (%):	**10**
Method:	A
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 39; PI = 27
Percent Retained on #4 Sieve = 3.4%; Percent Passing #200 = 63.0%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S23
Issue No: 1

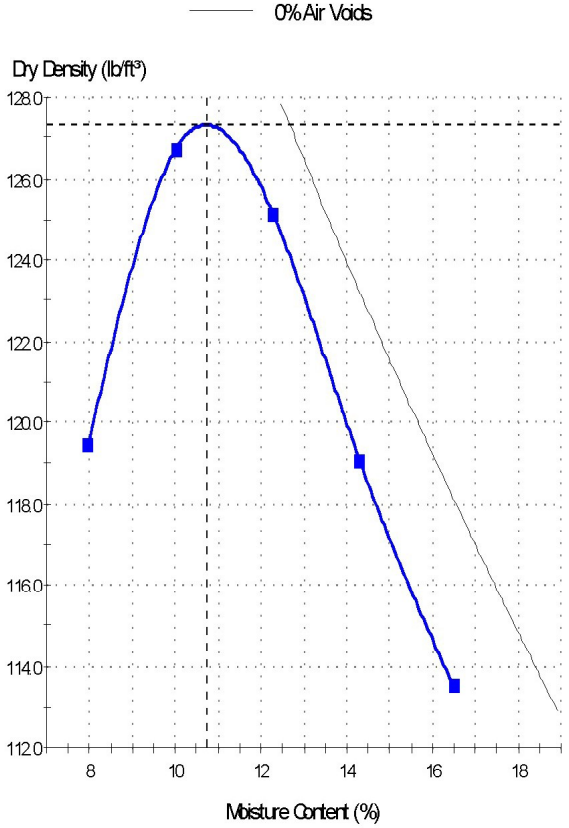
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/5/2013

Sample Details

Sample ID:	W13-000494-S23	**Alternate Sample ID:**	LSS-23; 0.5'-15'
Date Sampled:	3/12/2013	**Date Submitted:**	3/14/2013
Sampled By:	John Brooks	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-7-6 (19)		
Specification:	For Informational Purposes Only		
Location:	LSS-23; 0.5'-15'		
Tested By:	Shane Falwey	**Date Tested:**	3/21/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**127**
Corrected Maximum Dry Density (lb/ft³):	**127**
Optimum Moisture Content (%):	**11**
Corrected Optimum Moisture Content (%):	**11**
Method:	A
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 44; PI = 31
Percent Retained on #4 Sieve = 3.6%; Percent Passing #200 Sieve = 69.3%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S24
Issue No: 1

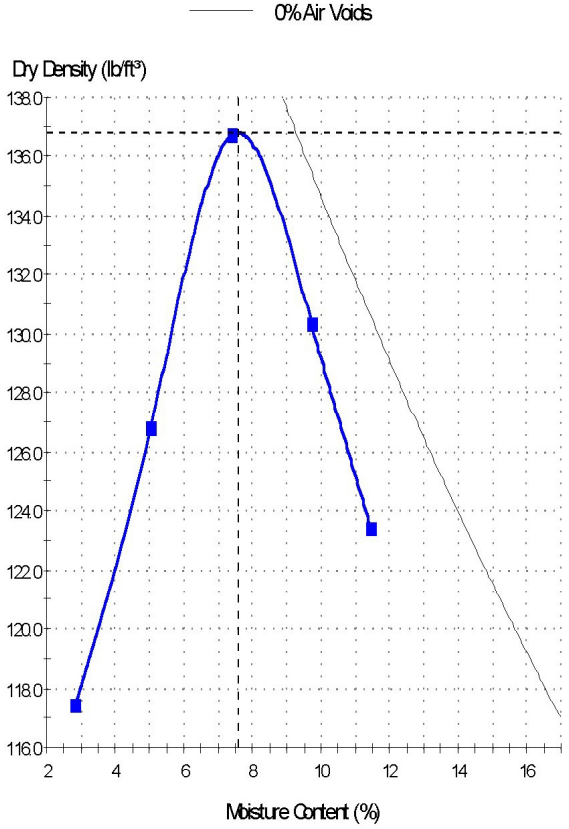
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/5/2013

Sample Details

Sample ID:	W13-000494-S24	**Alternate Sample ID:**	LSS-24; 2'-7'
Date Sampled:	3/12/2013	**Date Submitted:**	3/14/2013
Sampled By:	John Brooks	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Clayey Sand (SC); A-6 (3)		
Specification:	For Informational Purposes Only		
Location:	LSS-24; 2'-7'		
Tested By:	Shane Falwey	**Date Tested:**	3/25/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**137**
Corrected Maximum Dry Density (lb/ft³):	**137**
Optimum Moisture Content (%):	**8**
Corrected Optimum Moisture Content (%):	**8**
Method:	D
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 26; PI = 13
Percent Retained on #4 Sieve = 5.3%; Percent Passing #200 Sieve = 48.0%

Braun Intertec Corporation
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Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S25
Issue No: 1

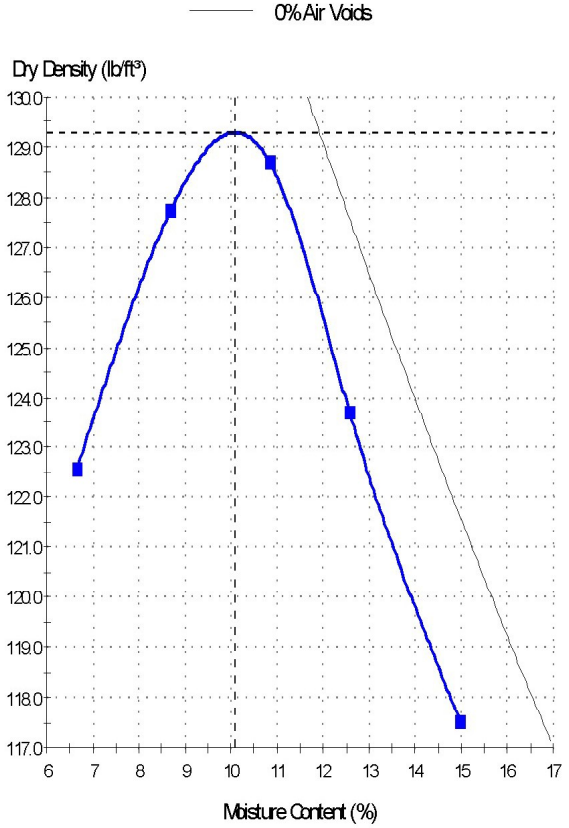
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/5/2013

Sample Details

Sample ID:	W13-000494-S25	**Alternate Sample ID:**	LSS-25; 0.5'-10'
Date Sampled:	3/12/2013	**Date Submitted:**	3/14/2013
Sampled By:	John Brooks	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-6 (14)		
Specification:	For Informational Purposes Only		
Location:	LSS-25; 0.5'-10'		
Tested By:	Kevin Ficek	**Date Tested:**	3/26/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**129**
Corrected Maximum Dry Density (lb/ft³):	**129**
Optimum Moisture Content (%):	**10**
Corrected Optimum Moisture Content (%):	**10**
Method:	A
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 40; PI = 27
Percent Retained on #4 Sieve = 4.3%; Percent Passing #200 Sieve = 64.4%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
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Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S26
Issue No: 1

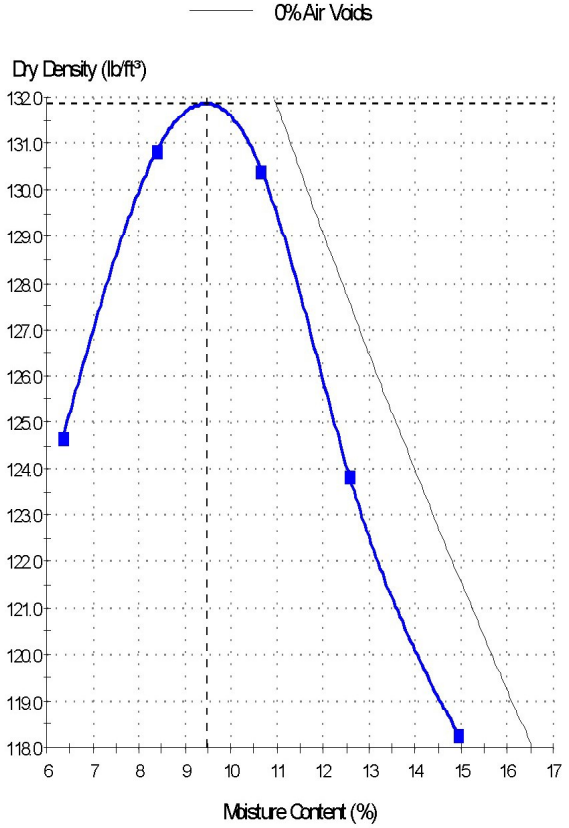
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/5/2013

Sample Details

Sample ID:	W13-000494-S26	**Alternate Sample ID:**	LSS-26; 0.5'-10'
Date Sampled:	3/12/2013	**Date Submitted:**	3/15/2013
Sampled By:	John Brooks	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-6 (8)		
Specification:	For Informational Purposes Only		
Location:	LSS-26; 0.5'-10'		
Tested By:	Kevin Ficek	**Date Tested:**	3/23/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**132**
Corrected Maximum Dry Density (lb/ft³):	**132**
Optimum Moisture Content (%):	**9**
Corrected Optimum Moisture Content (%):	**9**
Method:	A
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 30; PI = 19
Percent Retained on #4 Sieve = 2.7%; Percent Passing #200 Sieve = 60.7%

Braun Intertec Corporation
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Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S27
Issue No: 1

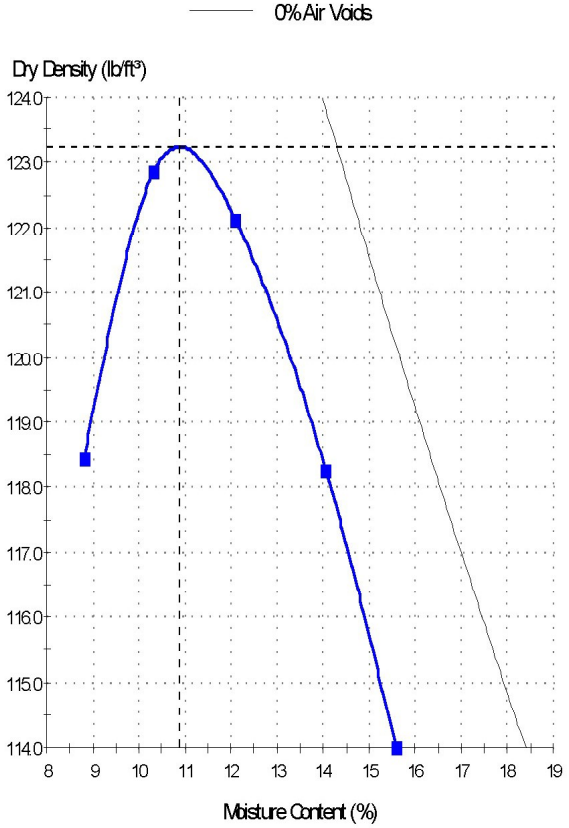
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/9/2013

Sample Details

Sample ID:	W13-000494-S27	**Alternate Sample ID:**	LSS-027; 0.3'-5'
Date Sampled:	3/23/2013	**Date Submitted:**	3/23/2013
Sampled By:	Christopher Elliot	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-6 (10)		
Specification:	For Informational Purposes Only		
Location:	LSS-027; 0.3'-5'		
Tested By:	Josh Beringer	**Date Tested:**	4/8/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**123**
Corrected Maximum Dry Density (lb/ft³):	**123**
Optimum Moisture Content (%):	**11**
Corrected Optimum Moisture Content (%):	**11**
Method:	A
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Dark Brown

Comments

Assumed Specific Gravity = 2.75
LL = 37, PI = 21
Percent Retained on #4 Sieve = 4.6%, Percent Passing #200 Sieve = 59.6%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S28
Issue No: 1

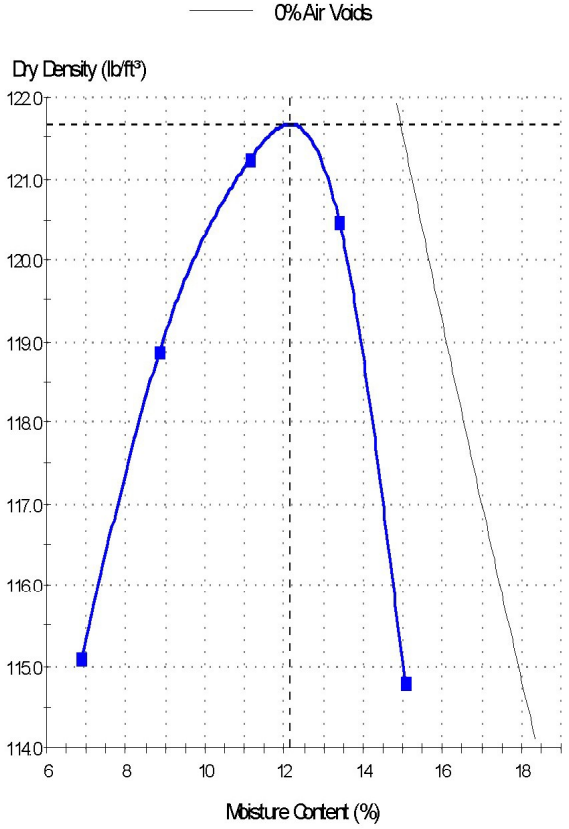
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/9/2013

Sample Details

Sample ID:	W13-000494-S28	**Alternate Sample ID:**	LSS-028; 0.3'-10'
Date Sampled:	3/23/2013	**Date Submitted:**	3/23/2013
Sampled By:	Christopher Elliot	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-7-6 (17)		
Specification:	For Informational Purposes Only		
Location:	LSS-028; 0.3'-10'		
Tested By:	Josh Beringer	**Date Tested:**	4/8/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**122**
Corrected Maximum Dry Density (lb/ft³):	**122**
Optimum Moisture Content (%):	**12**
Corrected Optimum Moisture Content (%):	**12**
Method:	A
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 44; PI = 30
Percent Retained on #4 Sieve = 4.2%; Percent Passing #200 Sieve = 67.3%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S29
Issue No: 1

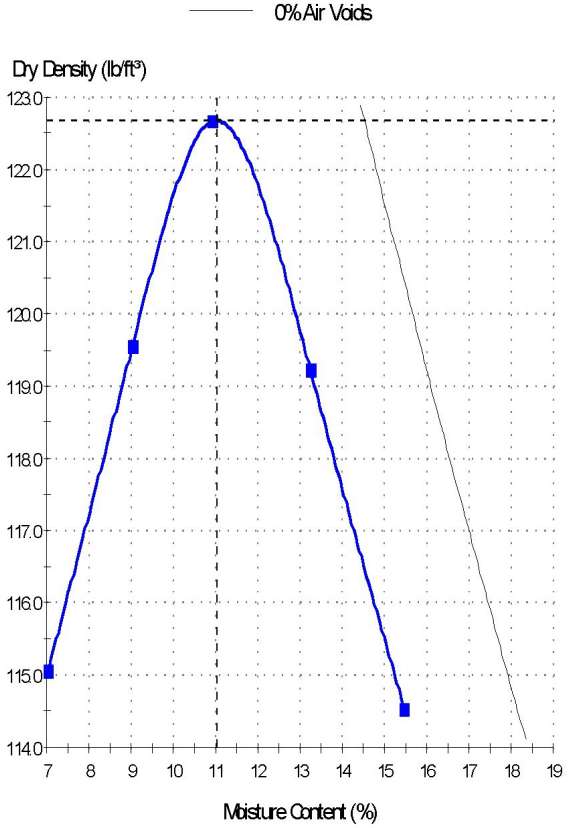
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/9/2013

Sample Details

Sample ID:	W13-000494-S29	**Alternate Sample ID:**	LSS-029; 0.3'-15'
Date Sampled:	3/23/2013	**Date Submitted:**	3/23/2013
Sampled By:	Christopher Elliot	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-7-6 (16)		
Specification:	For Informational Purposes Only		
Location:	LSS-029; 0.3'-15'		
Tested By:	Josh Beringer	**Date Tested:**	4/5/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**123**
Corrected Maximum Dry Density (lb/ft³):	**123**
Optimum Moisture Content (%):	**11**
Corrected Optimum Moisture Content (%):	**11**
Method:	A
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 41; PI = 27
Percent Retained on #4 Sieve = 1.1%; Percent Passing #200 Sieve = 69.2%

Braun Intertec Corporation
1341 South 20th Street, Suite 5, P.O. Box 1836
Bismarck, ND 58504
Phone: 701.255.7180

Proctor Report

Report No: PTR:W13-000494-S30
Issue No: 1

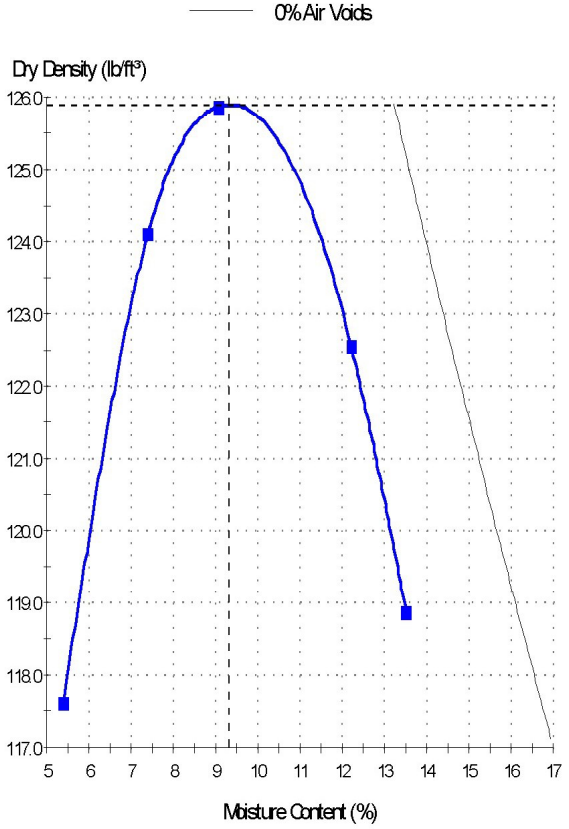
Client: Eric Bach
SRF Consulting Group, Inc.
Case Plaza
Fargo, ND, 58102
Project: FA-12-00359
Williston NW Bypass
Several Routes, NW of Williston
Williams County, ND, 58801
PM: Ezra Ballinger, eballinger@BraunIntertec.com

Brianne Nauman
EIT
Date of Issue: 4/9/2013

Sample Details

Sample ID:	W13-000494-S30	**Alternate Sample ID:**	LSS-030; 0.3'-5'
Date Sampled:	3/23/2013	**Date Submitted:**	3/23/2013
Sampled By:	Christopher Elliot	**Sampling Method:**	Soil Boring Auger
Source:	Williston NW Bypass Subgrade		
Material:	Sandy Lean Clay (CL); A-6 (9)		
Specification:	For Informational Purposes Only		
Location:	LSS-030; 0.3'-5'		
Tested By:	Josh Beringer	**Date Tested:**	4/4/2013

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180 - 01

Maximum Dry Density (lb/ft³):	**126**
Corrected Maximum Dry Density (lb/ft³):	**126**
Optimum Moisture Content (%):	**9**
Corrected Optimum Moisture Content (%):	**9**
Method:	A
Material on 19.0mm Sieve:	Removed
Rammer Type:	Hand round
Visual Description:	Brown

Comments

Assumed Specific Gravity = 2.75
LL = 34; PI = 21
Percent Retained on #4 Sieve = 2.5%; Percent Passing #200 Sieve = 60.4%